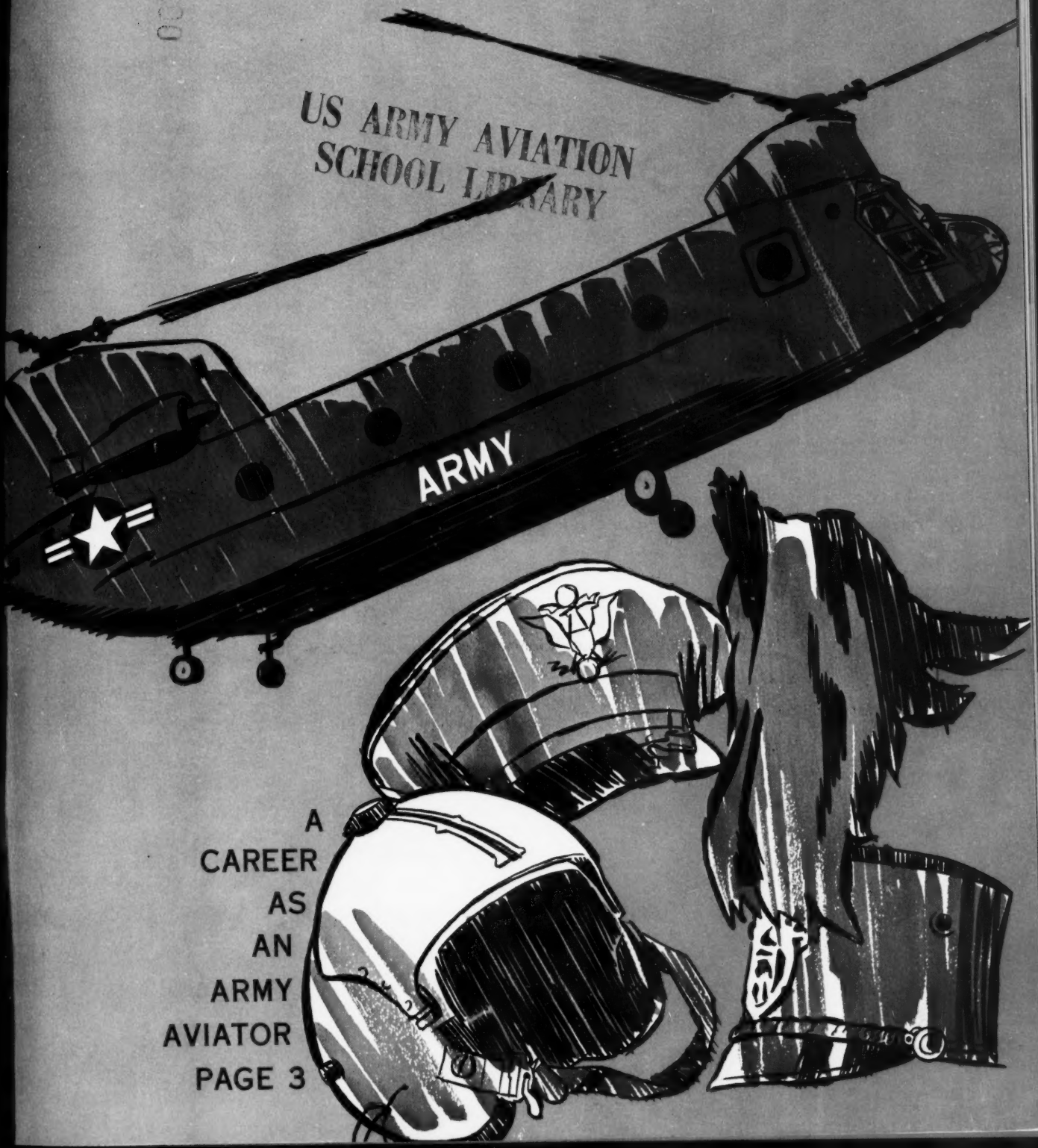
JANUARY 1963

UNITED STATES ARMY AVIATION DIGEST

US ARMY AVIATION SCHOOL LIBRARY



A CAREER AS AN ARMY AVIATOR
PAGE 3

UNITED STATES ARMY AVIATION DIGEST

DIRECTOR OF ARMY AVIATION, ODCSOPS
DEPARTMENT OF THE ARMY
Brig Gen Delk M. Oden

COMMANDANT, U. S. ARMY AVIATION SCHOOL
Brig Gen Robert R. Williams

ASST COMDT, U. S. ARMY AVIATION SCHOOL
Col Warren R. Williams

EDITORIAL STAFF

Maj Joseph H. Poole
Fred M. Montgomery
Richard K. Tierney
William H. Smith
M/Sgt Thomas M. Lang
Diana G. Williams

USABAAR EDUCATION AND LITERATURE DIV

Pierce L. Wiggin
William E. Carter
James E. Coleman

JANUARY 1963 VOLUME 9 NUMBER 1

CONTENTS

LETTERS 1

A CAREER AS AN ARMY AVIATOR, Brig Gen Delk M. Oden 3

SAFETY IN THE CENTURIES, Maj Pierce L. Wiggin, USAF Res 7

A COMMAND PERFORMANCE, Lt Col Leland Cantlebary 10

CHANGE IT!, Milburn P. Meriwether 12

ARMY AVIATION OPERATION IN VIETNAM, Lt Col Thomas J. Sabiston, Ret 14

EJECTION SENSE, Barney A. Roth, Jr. 21

SKYCON TRAINING, Capt Ralph W. Broman 22

ARMY LOG AIR IN ALASKA, Lt Col Frank B. Case 29

TWX 32

THE ARMY AVIATION STORY, PART VIII, Maj Roland H. Shamburek and Col Spurgeon H. Neel 34

HELICOPTER MOUNTAIN FLYING, Capt Harold T. Campbell 40

CRASH SENSE 43

The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine, and other related data.

The DIGEST is an official Department of the Army periodical published monthly under the supervision of the Commandant, U. S. Army Aviation School. Views expressed herein are not necessarily those of Department of the Army or the U. S. Army Aviation School. Photos are U. S. Army unless otherwise specified. Material may be reprinted giving credit to the DIGEST and to the author, unless otherwise indicated.

Articles, photos, and items of interest on Army Aviation are invited. *Direct communication is authorized to: Editor-in-Chief, U. S. Army Aviation Digest, Fort Rucker, Alabama.*

Use of funds for printing of this publication has been approved by Headquarters, Department of the Army, 27 November 1961.

To be distributed in accordance with requirements stated in DA Form 12.

LETTERS

Sir:

Please accept my thanks for the copies of the U. S. ARMY AVIATION DIGEST. It is very interesting and I am happy to have had a part in "The Army Aviation Story."

It covers a long period during which the Army played a major role in developing balloon service and then aviation, which now is so important in the National Defense.

Again, many thanks and best wishes.

FRANK P. LAHM
Brig Gen, USAF, Ret
317 Seneca Avenue
Huron, Ohio

Sir:

I acknowledge, with thanks, . . . Parts I and II of "The Army Aviation Story". . . .

Needless to say, I read it with a great deal of interest and a certain amount of nostalgia. I thought it was an excellent piece of writing.

GORDON J. WOLF
Cohen & Wolf
Fifth Third Bank Building
Cincinnati 2, Ohio

Sir:

I am an Army Aviator presently attending Auburn University under the Degree Completion Program, obtaining my degree in Aeronautical Administration. Since the Army has placed such strong emphasis on all officers having at least a bachelors degree, I felt that many officers in aviation might be interested in knowing of the opportunity for qualified individuals to attend this school and obtain a degree in a field which is quite pertinent to aviation and related activities. The curriculum allows emphasis in such fields as Business Administration, Industrial Management, Production Management, etc.

Army Aviators who have completed two or three years of college-level work, including college algebra, physics, chemistry, and English can quite often qualify for a bachelors degree within one calendar year as allowed under the Degree Completion Program.

BENNY L. BOOTH, Captain
435 Sangers St
Auburn, Alabama

Dear Sir:

As a student of special warfare may I express my personal gratitude to you and your staff for the four fine articles you have published on the subject in the last two issues. The authors are to be heartily congratulated for the excellent job they did. Their efforts should stimulate the much needed thought on this subject.

FRANKLIN MARK OSANKA
1926 N. Powhatan
Arlington 5, Virginia

Sir:

Development of Army aircraft progresses at a rapid pace. Each day we read of new sophisticated aircraft or revolutionary modifications of existing models. Worthwhile gains are certainly being made in the standardization of aircraft fuels and the improvement of overall aircraft maintenance support.

Are we, however, devoting enough attention to the development of durable, versatile, and practical ground equipment to support our expanding aircraft inventory under field conditions? How long must we operate with such items as our worn-out 1,200-gallon tankers? How long will our TOEs reflect inadequacies in all types of nonflying equipment?

Our problem becomes a very real one when we study the ROAD organization with its decentralization of aviation. What will be provided, for instance, to support those six LOHs in each brigade flight detachment? It appears that aviation must be prepared to operate from many unimproved locations for substantial periods of time under varied conditions.

One possible solution to the problem of supporting small isolated aviation elements lies in a multipurpose tactical vehicle. This vehicle could be a modification of an existing wheeled or tracked vehicle. Component parts of this vehicle should include the following:

• A trailer for aircraft fuel with component pump, filter-separator and hoses.

• Tactical radios allowing for short-range, ground-to-air and long - range, ground - to - ground communications.

• A small compact homing beacon of advanced design to operate in conjunction with aircraft instruments similar to the ADF or omni.

• Bins for the storage of aircraft parts and tools to include special tools.

• Storage facilities for aircraft oil, aircraft weapons and ammunition (if applicable), ground-handling equipment, camouflage equipment, helipad lighting and marking equipment, and individual gear.

• Built - in auxiliary power units and heating devices for aircraft support.

• A rack on top of the vehicle for the ground transportation of one LOH. This rack could be used to transport the aircraft during submarginal weather conditions or to evacuate damaged aircraft.

The vehicle described, issued intact with all mentioned components, and manned by qualified specialists, could provide for substantial periods the mobile bases for the many isolated aviation elements in the ROAD organization. No longer would aircraft have to depart supported units at critical times to refuel at distant centralized locations; no longer would aircraft have to scurry "home" in winter for fear of having difficulty starting without a Herman Nelson heater and APU; no longer would minor maintenance become a major problem resulting in loss of aircraft.

The optimum size of a vehicle with this mission is worthy of discussion. Though a ¾ - ton truck would be ideal for airborne division purposes, perhaps only one of 2½-ton size could pull the fuel trailer. Perhaps the modification of an APC would be ideal for mechanized and armored divisions.

The use of a fuel trailer complete with pumping and filtering equipment offers flexibility not found in the tanker truck.

Very obvious savings in manpower become apparent in the use of this type of setup. For instance, the requirement for vehicle drivers, always at a premium in aviation units, would be decreased.

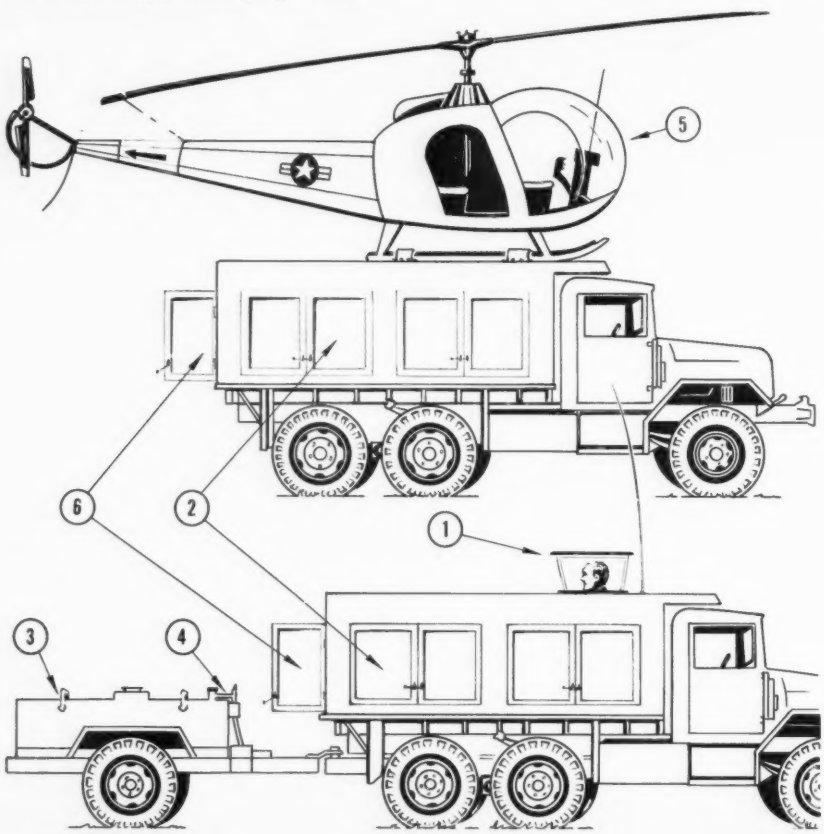
This multipurpose aviation support vehicle is but one thought toward placing aviation where it's needed, when it's needed, and how it's needed on the battlefield. Without effective supporting equipment, our many varied and expensive flying machines could well be worthless to the ground commanders who certainly need and deserve them.

PAUL B. MALONE, III
Captain, Infantry
Hq, 1st Corps (Group)
APO 358

• *Ideas are the vehicles for advancement in our program. How about turning this one in locally as your contribution to the Army's Suggestion Program?*

TACTICAL AVIATION SUPPORT VEHICLE

1. *Hatch in top of vehicle for control tower operations.*
2. *Bins for storage of tools, heater, APU, etc.*
3. *Removable fuel container on trailer with rings for sling loading.*
4. *Fuel pump, filter separator, hoses mounted on trailer.*
5. *LOH in traveling position. Clamps used to secure aircraft to top of vehicle.*
6. *Rear door to interior of vehicle containing parts, bin, radios, and individual equipment.*



"Army Aviation has much to offer . . . and demands much in return . . ."
DELK M. ODEN, Brig Gen, USA
Director, Army Aviation, ODCSOPS

A CAREER AS AN ARMY AVIATOR

Brigadier General Delk M. Oden

WHAT IS ARMY Aviation? What is its role and mission? What is its future? Can I qualify? What training will I receive? What will be demanded of me as an Army Aviator? How will it affect my overall career?

These and many other questions are, no doubt, foremost in the minds of young men at West Point and those on active duty who contemplate a career in the dynamic, rapidly expanding Army Aviation program of our modern Army. Let's look at these and other vital questions, separately and in detail.

WHAT IS ARMY AVIATION?

Army Aviation is that aviation organic to the arms and services of the Army. Immediately responsive to the demands

OV-1 performs missions of observation, surveillance, recon

of the commander, it is employed to enhance the mobility, flexibility, and battle efficiency of ground combat forces.

WHAT IS ITS ROLE AND MISSION?

Army Aviation is integrated throughout the Army and rightly has no branch of its own, since its very being is dependent on an instant response to the immediate commander's desires. The mission of Army Aviation is to augment the mobility of the Army to conduct effective combat operations. Such a simple statement of mission is deceptive at first reading. The present capability of Army Aviation to augment effective combat operations is impressive. The future outlook is more so.

WHAT IS ITS FUTURE?

The requirement for even greater mobility in ground warfare of the future dictates the employment of more aerial vehicles and subsequent expansion of Army Aviation. As an indication of such expansion, the 103 aircraft now organic to the ROAD Division is highly significant.

Why is such a strong reliance placed on Army Aviation? It provides a highly responsive means of obtaining information of the enemy. It affords the means of instant reaction to such information.

The family of multipurpose aerial vehicles under development gives the Army the means to fulfill its requirements for tactical mobility, observation and surveillance, weapons delivery systems, casualty evacuation, aerial command posts, resupply, etc.

We are modernizing our fleet of aircraft at a pace at least equal to the modernization pace of the Army. This requires replacement of obsolete equipment with new and improved gear. Progress in this area is gaining momentum. Currently there are 13 different types of aircraft. This number will eventually be reduced to 7 which will retain all the capabilities of the present 13 types and have added versatility.

Tactical and logistical advantages gained by this reduction in number and increase in ability are numerous. For example, using only one type aerial troop carrier, a single loading plan can be used, rather than having numerous plans for the different types presently used. The forward area maintenance problem is subsequently reduced, and fuel resupply is simplified because only one grade of fuel will be required.

UH-1 with 2.5 rockets for defensive or suppressive fire

Some of the finest aircraft of their type in the world are presently in use in our program. The vast improvements made by the aircraft industry from 1940 to 1962 have produced such excellent aircraft as the turbine-powered OV-1 Mohawk and the UH-1 Iroquois. The Mohawk is capable of speeds of over 250 knots and requires little more landing distance than the old Piper Cub. The Iroquois, in its three configurations, observation, aerial reconnaissance and troop transport, is an extremely versatile helicopter. Appropriately named the "Squad Carrier," since it seats the full combat infantry squad, it is fully responsive to our needs. Vulnerability is reduced by providing aerial fire from its machineguns or rockets to suppress or discourage enemy ground fire. The Iroquois can also be used to provide aerial escort for other aircraft during airmobile operations and in an aerial evacuation role.

The CH-47A Chinook, a tandem-rotor, turbine-powered helicopter, can carry 32 combat-loaded troops or 4-5 tons of cargo. Ground vehicles and an assortment of weapons can be transported in this versatile machine.

The CV-2A Caribou, a twin-engine, fixed wing transport, can operate in essentially the same environment as our present lower performance observation aircraft, which use relatively unprepared landing strips approximately 1,000 feet long.

Designed for instant responsiveness to the commander's desire, all of this equipment is fully capable of operating right along with the ground soldier, "living" in his environment.

CH-47A Chinook carries 32 combat equipped troops

CAN I QUALIFY?

Qualification for aviation training is defined in Army regulations 600-105, 611-110, and 614-100. Department of the Army Pamphlet 600-3 also provides details concerning our Army Aviation program and will further orient you. Medical standards are prescribed in AR 400-501.

Essentially, you must pass a flight physical examination (some of the medical restrictions and requirements of AR 611-110 can be waived); be 30 years old or younger (some waivers can be granted here for special technical qualification, prior flying experience, and technical college degrees); pass an aptitude test; and, if a Regular Army officer, have completed the basic course in airborne or ranger training and have a year of troop duty.

U. S. Military Academy graduates accepting appointments in the Regular Army may voluntarily elect Army Aviation flight training before graduation and commissioning. Such actions constitutes application for training, which will be programmed as soon as possible after completion of basic officer's training and one year of troop duty. For those who do not volunteer for flight training before appointment in the Regular Army and for those already on active duty, application can be made according to the above regulations with the same prerequisites applicable. It is normally more convenient for West Point cadets to make application via the volunteer election method.

WHAT TRAINING WILL I RECEIVE?

Those accepted for training will be sent to either Fort Rucker, Ala., for fixed wing training or to Camp Wolters, Texas, for rotary wing training.

Fixed wing training at Fort Rucker is broken down into three phases:

Phase A, 15 weeks of primary flight, is conducted by a contract firm and consists of 102 hours of basic flight training in the O-1 Birddog. Ground school courses in aerodynamics, navigation, and maintenance are also given in phase A.

Phase B is the tactical application of Army Aviation and consists of road and strip work, aerial resupply, aerial fire adjustment, etc.

STOL CV-2 Caribou has intra-Army support mission capability

Phase C consists of 50 hours of instrument training in the U-6 Beaver.

Rotary wing entrants spend 16 weeks at Camp Wolters, accumulating 111 flying hours in the OH-23 Raven. The related ground school program is similar to the fixed wing program. After completing Phase I at Wolters, classes split up. Some students are assigned to Fort Rucker for 14 weeks of Phase II training in cargo and utility helicopters, such as the CH-34 Choctaw and UH-1 Iroquois. The remaining students, after transitioning into the OH-13 Sioux helicopter at Wolters, take 4 weeks of tactical training at Fort Sill, Oklahoma. Subjects included in this training phase are: artillery gunnery, aerial adjustment of artillery fire from OH-13s, and aerial gunnery. In the future, students may receive a third phase, helicopter instrument flight training.

Successful graduates of either the fixed or rotary wing course, having met the big challenge offered, are rated as Army Aviators.

WHAT WILL BE DEMANDED OF ME AS AN ARMY AVIATOR?

Your career pattern as an Army Aviator will be almost identical to that of your nonrated contemporary. No aviation branch exists or is contemplated; therefore, you remain a member of the Infantry, Armor, Artillery, etc. branch and your participation in the Army Aviation program is *in addition to* the career load you must carry in your branch.

As an Army Aviator you must be able to absorb divergent training and perform divergent duties, i. e., you must maintain the pace set by your branch requirements and *also* fulfill the demands of Army Aviation as a rated aviator. Although stringent, these requirements bring forth those individuals with the outstanding qualities needed in the Army Aviation program. In addition to the physical requirements for becoming an Army Aviator, you can well see the difficulty in filling aviation flight training school quotas due to these demands on the individual.

Your aviation training does not end after graduation from flight school. Aviators must meet the continuing requirement of remaining abreast of new techniques, procedures and developments. Besides maintaining basic proficiency and developing skill and experience in the aircraft in which you were rated after graduation from flight school, you may possibly cross-train in fixed/rotary wing to increase your capability.

Normally, after graduation you will serve with an aviation unit for approximately 3 years. Following this duty, you will probably attend further branch schooling and will possibly perform another ground tour with your branch while also maintaining your flight status. By this time you will have developed the desired pattern of experience and maturity in the program and will be a member of an organic aviation unit of a combat division, corps, or army. You will be equally conversant with the problems of the ground soldier and those of Army Aviation.

HOW WILL IT AFFECT MY OVERALL CAREER?

The Army Aviation program has no room for the officer who can perform well in flying jobs alone. You must be both a highly competent officer in your branch as well as a highly competent Army Aviator. As a result, your career development in respect to your nonflying contemporaries will not suffer due to your added capability to the Army as an aviator. In fact, your added capability is a definite asset to you in your career.

To those of you who choose to enter and qualify for the coveted wings of an Army Aviator, welcome to a challenging, rewarding career in Army Aviation. Although the demands upon you will be great, Army Aviation has much to offer.

Major Pierce L. Wiggin, USAF Res

WHILE DRIVING over the causeway to the Gulf coast reservation of Tyndall Air Force Base, you hear the jet scream of an F-102 Delta Dagger as it arcs over the water, trailing a smoky wake. Tyndall, home of the 73rd Air Division, is the testing ground for Air Defense Command aircrews. Flying the latest supersonic aircraft, the crews come to test their rocket and missile firing accuracy and master new interceptor methods.

On the surface it might appear that flying safety in mach-busting fighters is unique, separate and apart from any other type of aviation. Not so. According to Captain Richard A. Brown, flight safety officer for the 4756th Air Defense Wing, flying safety at Tyndall requires time-tested principles and methods that work for any effective aircraft accident prevention program. During a recent interview, Captain Brown, an interceptor pilot with some 2,700 flying hours, took time out from his busy schedule to explain why.

Flying safety, whether you're flying high altitude interceptors or treetop choppers, begins with

an open door to the commander for the safety officer. This direct channel must be assured for a successful program. It is vital to keep the commander informed on all matters relating to flying safety, one of his primary responsibilities; and it promotes rapid correction of deficiencies in equipment, facilities, and personnel that are current or potential flying hazards.

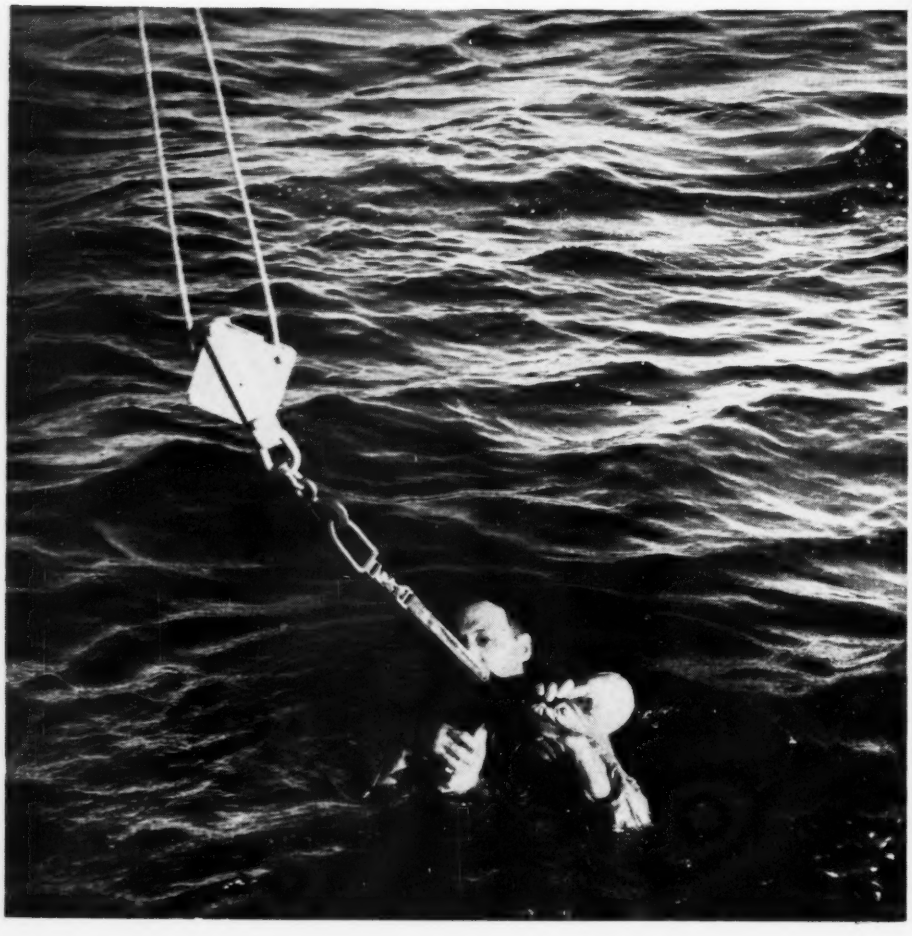
Why a *fulltime* flight safety officer? Because aircraft accident prevention is a fulltime job —*a job no commander has the time to perform.* Flying safety is an Air Force career field. To qualify for the flight safety officer AFSC, a candidate must be a highly experienced pilot and a graduate of the aviation safety course at the University of Southern California.

The flight safety officer's job is to administer and monitor the accident prevention program for his unit or base. At Tyndall, Captain Brown has a monthly emphasis calendar for guidance. It includes such items as . . .

Compliance with checklists
Operational and maintenance concepts
Work procedures
Evaluation of maintenance facilities
Operational procedures
Training standards
Compliance with tech orders
Review of tech manuals and job training aids

Up and Out

Into the helicopter rescue sling



Personal protective equipment
Supervision and management
In addition to these and many other items for regular and frequent emphasis, he maintains a flying safety survey schedule. Safety surveys are not conducted in a cloak-and-dagger manner; nor are they used to embarrass or point the finger at any particular unit or individual. Rather, the survey is a means of bringing hazards to light so that corrective action may be taken before the hazards become accident cause factors. Follow-up surveys are made to ensure that corrective action is effective.

The value of a fulltime flight safety officer is evident at Tyndall. It's evident in . . .

Operations—where the operations officer keeps current flying safety publications in a convenient location and maintains a card file of aircrew personnel. Before they are cleared to fly, pilots must initial their card records to show they have read these publications.

A flight line dispensary—manned by a flight surgeon during scheduled hours each day. The flight line location encourages aircrew personnel to report health problems they might otherwise ignore or postpone. Flight surgeons fly in each type of aircraft to better understand the operational environments of their charges.

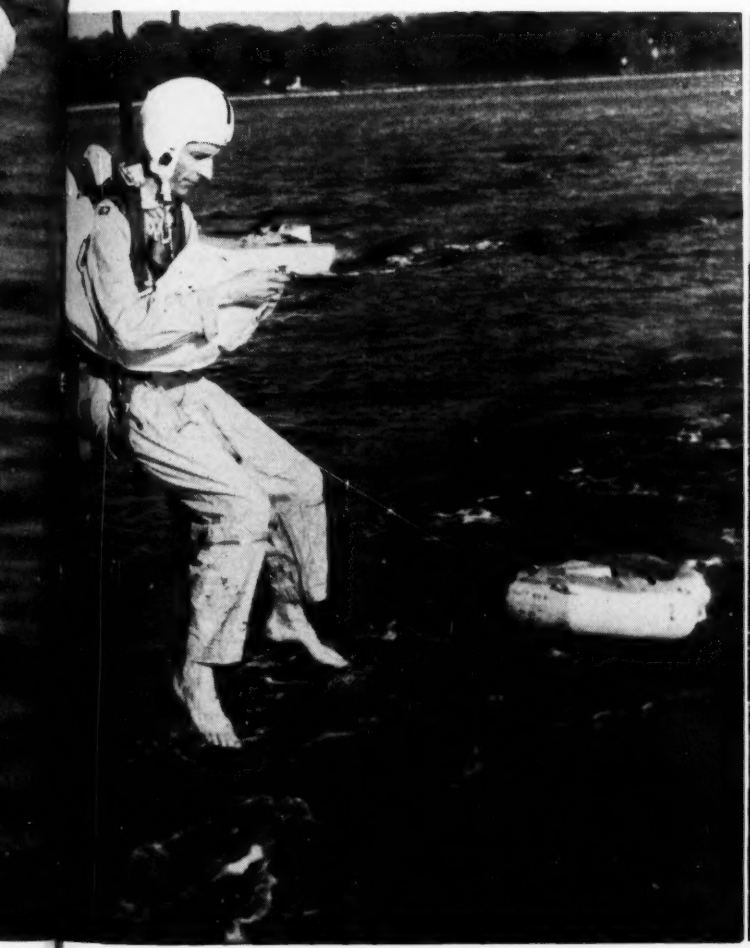
Maintenance—where shops and hangars, equipment, and personnel are hazard-free and efficient.

Facilities—where frequent inspections assure clean and hazard-free runways, taxiways, tarmacs, and parking stands.

Survival equipment training—given to aircrews. We watched four pilots go through the bailout and survival training program, which included classroom instruction, practice parachute landings in a sawdust pit, and water landings from the stern of a drone recovery boat.

Thanks to a fulltime flight safety officer and a continuing and effective accident prevention program, flying safety is a way of life at Tyndall.

Water wings inflated



Down for dinghy practice

As 1963 begins, each unit commander should seriously consider the question, Should Safety Be

A Command Performance?

Lieutenant Colonel Leland Cantlebary

A COMMANDER never feels his responsibilities more than when he has to inform an individual's immediate family of an accident which has resulted in serious injury or death. Sometimes, however, it takes this duty to motivate the commander into thinking of his responsibility to establish an effective safety program. It also makes him wonder how to organize this program in a manner which will produce results.

Safety has many aspects—psychological, material, mechanical, and physical. To accompany these viewpoints are volumes of prolific and profound writings, all offering a "true" solution to the age-old problem of safety. But with all of this material available, accidents continue to happen. Perhaps these new or psychological approaches to safety need a more basic insight.

Four basic factors are to be considered in a good safety program: knowledge of the problem, proper procedures, setting the example, and the follow up.

Knowledge of the problem. A commander cannot hope to establish or conduct a safe operation unless his knowledge of the situation is greater than that of his men. To gain this knowledge he can seek the help of periodicals written by United States Army Board for Aviation Accident Research, or other aviation safety organizations, for aviation-related accidents and such groups as the National Safety Council for other type safety material. By taking sufficient time to *completely* inform himself about the problems, the procedures, the men involved, and the nature of the equipment to be used, he can prepare a workable safety program.

Of course, we can never overlook a man's past experience. Just as, theoretically, more hours in the cockpit of a plane make a man that much safer, so, too, should more years of experience as a commander make a man that much more capable of using adequate insight in setting up his program. If the commander is short on experience, he has even more reason to adequately inform himself through intensive study.

Proper procedures. Safety procedures are and should be carefully thought-out methods of conducting activities to produce a minimum of unsafe actions. Knowledge of the subject matter is necessary, as well as logical, clear thinking. In other words, unless a man shows good judgment in applying his knowledge, he cannot hope to set up safe procedures. For example, to require pilots and crews to operate when they have had insufficient sleep and rest is to invite accidents.

Through prior study the commander has learned the essential elements of aviation safety, such as planning a flight and proper control of the aircraft in different situations. This makes it possible to set up safe and realistic methods of operation. One point often overlooked in establishing SOPs is the individual's attitude and mental conditioning. To merely publish a new SOP and then punish a man who deviates from these rules of conduct is not being realistic. A man cannot be a safe person simply because the SOP says he will be. The individual should be fully informed of the reasons behind required actions.

Few people are as aware of the problems as the pilots and mechanics themselves. To give them the opportunity to submit suggestions for improving the situation is a forward step in bringing about complete acceptance of new procedures. Why is crew acceptance so important? Let's look at it this way. If a crew is instilled with the idea that it is important to play it safe, then they become aware of

Col Cantlebary is Chief, Airfield Operations Section, U. S. Army Aviation Center, Fort Rucker, Ala. He is a Senior Army Aviator.

unsafe acts more readily. Rather than running emergency alerts and judging response, it is definitely far more effective to have a completely workable, well thought out, acceptable means of conducting the business at hand. Psychologists have proved that a man is more likely to demonstrate confused thinking in a real emergency than in a pretended emergency. That's why we practice evacuating a building in the event of a fire. The individuals involved will learn more from an orderly fire drill than they would ever learn should they suddenly hear a fire alarm.

Set the example. No matter how much study has gone into the safety program and regardless of how satisfactory the resultant SOP may be, if a proper example is not set, then all is for nought. There can be no fluctuation in safe actions. Either you are safe or you aren't.

For the commander to disregard his own established procedure is to invite his men to do likewise. To personally allow any deviation from safe practices nullifies even an excellent safety program. Time and expediency are insufficient reasons for dismissing safety precautions.

The American Telephone and Telegraph Company, one of the world's largest, has a safety slogan that reads something like this: "No job is so important or a service so necessary that you cannot take the time to do it safely." This is an ideal attitude for any commander who desires safe operations.

The follow-up. Your plan may be near-perfect but no matter how much time was put into its preparation, establishment, and execution, the follow-up is the crucial issue.

To announce a new or stronger SOP and then to let things ride cancels out any and all good intentions. In setting up your program you have obviously considered such items as training, experience and individual comfort. You have, no doubt, decided which man is the most safety conscious. He can be used as an assistant safety inspector.

However, we must consider once again common sense and good judgment. Why does a man walk into a rotating propeller? Ruling out the desire to commit suicide, we come up with only two reasons: inattention or distraction. Your SOP should have provided for a minimum number of distracting elements in the work area. If this has been done, then we can consider causative factors for inattention.

The primary factor may be working while inebriated. This isn't difficult to observe and correct. But, how do you determine when a man brings his troubles and problems to the job? Bringing family quarrels to the shop, the flight line, or in actual flight, is one sure way of creating unsafe conditions.

Two methods may be used to help correct this deficiency. If a man commits an obviously unsafe act, we can assume that he doesn't have his mind on his work. The question is "Why?" If he is the type who just doesn't care, you know how to handle him. But if he has family troubles, what should you do?

A man who has personal problems just doesn't belong in the air, on the flight line, in the control tower, or in the maintenance hangar. Whether you send the man to the chaplain or give him a pass to work out his problems is your decision. But the point is that you, or someone who knows the general disposition of the men, should talk with or observe each one as they prepare for duty. Thus you can catch the man likely to be inattentive before he has an accident.

One obvious method of adequately following up on your program is to conduct frequent inspections. Whether you choose just one unsafe act to look for each day or many is your prerogative. But if you do not emphasize your personal concern for safety by regular inspections, soon the men will also show a diminished concern.

We have not discussed incentive plans as a way of building spirit and morale. Means and methods of punishment for men who have accidents repeatedly haven't been covered. Nor have we cited specific examples of unsafe conditions or hazardous actions. All of these items are outside the scope of this discussion. Their adoption, execution, and consideration require a bit of ingenuity on the part of the unit leader.

A four-step plan for inaugurating a workable safety program has been proposed. It includes the basic and essential leadership aspects of knowledge of the problem, the establishment of proper procedures, setting a personal example, and following up. This is not a revolutionary proposal. There is nothing new here at all, and it may never gain recognition for you at the general officer level.

The one important point that has been continually emphasized throughout this discussion is the necessity for the commander's personal concern. We have not said that safety can be discovered in a single textbook, or that any one man in your unit holds the key to accident-free operations. But we do feel that safety is a responsibility of the unit leader. This responsibility cannot be delegated or disregarded.

After all, safety should be a command performance!

Maintenance and supervisory error caused an accident when someone insisted on "Hurry Up and

Change It!

Milburn P. Meriwether

IT WAS A BRIGHT, clear, cool morning. There was a thin layer of high cirrus clouds and the visibility was unlimited. Sergeant Fitzgerald was just finishing the installation of a new fuel pump on the engine of the U-6A Beaver. Approaching across the ramp was Lieutenant Wagner and Mr. Lorenback, civilian technical representative. Lieutenant Wagner and Mr. Lorenback had been testing some new drop shackles and a specially designed sight for low-level drop loading techniques. This was to be the lieutenant's last flight of the test before departing for an overseas assignment. The tech rep was to return to his company's factory for further training in later model equipment.

Lieutenant Wagner said, "Hi Fitz, is the old bird all set to go?"

Sergeant Fitzgerald answered, "Not quite, Lieutenant, I've gotta get the technical inspector out here to shake down this new pump installation."

"Can't you sign it off, Sarge?" queried Wagner. "You've had more experience in aircraft maintenance than that old grandma they've got for a TI. By the time he gets through nit-picking this job it'll be lunch time. I've got to bug out of here by 1400 hours to catch that airliner to the coast, and I want to get one last mission on this low-level test before I leave."

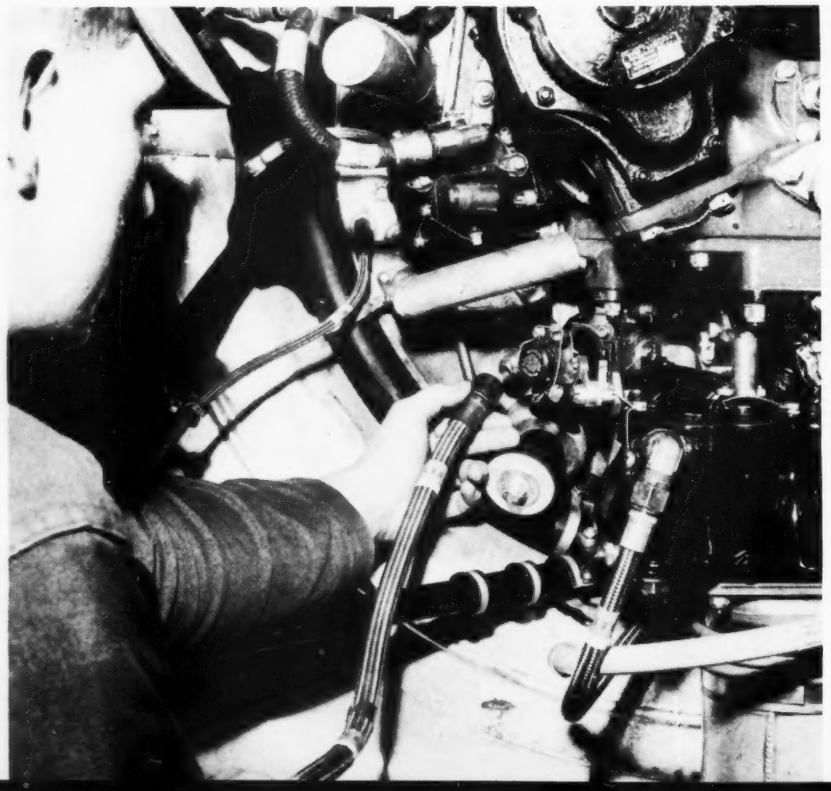
"Well," said Fitz, scratching his head, "I shouldn't do it, Lieutenant, but I know the engine is in good shape. Corporal Samson and I got here real early and ran the engine up and adjusted the fuel pressure so's we'd have it ready for you first thing this morning. I tell you what, I'll erase this red cross and put this fuel pump change on a diagonal. That way we won't need an inspection. Is that OK?"

"That'll be fine, Fitz. I knew an old crewchief like you could come up with a gimmick so I could get this last flight in," Lieutenant Wagner called over his shoulder as he climbed into the cockpit.

Little did he know.

While the lieutenant and Mr. Lorenback were getting settled in the cockpit, the drop loading crew hung a couple of practice bundles on the shackles and Sergeant Fitzgerald and Corporal Samson buttoned the cowl around the engine.

The engine sounded smooth and sweet on the takeoff run down the runway. The "bird" lifted into the blue and started a climbing turn to the drop zone



Milburn P. Meriwether is assigned to the Special Subjects Branch, Intermediate Maintenance Division, Department of Maintenance, Fort Rucker, Ala.

Hurry up and change it action resulted in fatal accident

heading. Sergeant Fitzgerald and Corporal Samson were heading for the coffee bar when suddenly they heard the engine running rough and misfiring. They turned and saw what looked somewhat like a vapor trail following the aircraft and then black smoke pouring from it. As they continued to watch in wonderment, they saw a large object fall from the aircraft, followed by a long, white streamer just as it disappeared into the treetops. The aircraft continued flying for a few seconds longer; then it, too, disappeared into the treetops.

This was indeed the last flight for the lieutenant and tech rep in a manmade flying machine.

Upon investigation, the accident investigating team readily determined the cause: *maintenance* and *supervisory error.* Simple as that. When the fuel supply line to the engine driven fuel pump had been installed, the hose coupling had not been tightened. The fuel line vibrated loose from the pump and—well, that's all she wrote.

Good maintenance must have good supervision. Good maintenance is not rushed maintenance. The good crewchief must take his time and be thorough in his work. Regardless of how many times he has performed a job, if there is a possibility that he could make an error or overlook a vital flight safety item, the crewchief should "have it inspected by the organizational inspector or other qualified supervisory personnel."

Once a red symbol has been entered in the -13, it will not be erased. The only time that it will be changed is after corrective maintenance has been accomplished and, if required, properly inspected.

Any time that an item or accessory is removed and improper installation would create a flight safety hazard, a red cross will be entered on the DA Form 2408-13 to ensure an inspection by the aircraft technical inspector, maintenance supervisor, or other qualified supervisory personnel as designated by the maintenance officer.

The red cross or red diagonal entered in the -13 by the individual who makes the inspections or performs work will represent the opinion of the individual as to the condition of the defect. Therefore, no individual will be directed nor encouraged to change the symbol which has been entered. If any individual of higher responsibility within the maintenance or repair unit believes that the condition is more or less serious, that individual may change the symbol himself. When this is done, that individual then assumes the responsibility and enters his signature in the -13.

Today, the emphasis is on speed. Many millions of dollars are spent to develop aircraft and machines that will fly faster and accomplish work more quickly. Numerous studies are continually being conducted to reduce manhours required to accomplish given jobs, thereby cutting costs. This is all very well and essential in our present day economy. However, safe maintenance practices should not be sacrificed for speed. No individual should rush a mechanic to accomplish a job to the point where he may overlook those final checks to ensure that the job had been done correctly and safely. There is more truth than poetry in the old adage that "Speed Kills," whether on the highways or in the aircraft maintenance shops.

Heliborne Vietnamese Smash Trapped Guerrillas

SAIGON, SOUTH VIETNAM (Special) — South Vietnamese troops supported by U. S. Army helicopters yesterday trapped and annihilated a large force of Viet Cong guerrillas about 60 miles west of here, an Army spokesman revealed today.

This precise operation was accomplished in just over two hours with minimum South Vietnamese losses, the spokesman said. It represents the type of hard-hitting airmobile action being developed to counter Communist directed guerrilla activity in this Southeast Asian country.

The guerrilla force was first located at 6:30 a.m. yesterday when an observation airplane spotted unusual activity near a small village in the jungle. Intelligence officers were certain that this was a Viet Cong force that had attacked several outposts during the night. An airmobile force located about 20 miles from the enemy was notified, and by 7:15 a.m. it was fully briefed, oriented, and ready to go. Fighter planes also were alerted.

By 7:20 the observation plane was overflying the suspect area and guiding the airmobile force toward the objective. At about 7:30 the helicopter and fighter plane flight leaders made radio contact and coordinated arrival times so the fighters would attack on time.

During the final phase of the flight, the airmobile force flew at treetop level—to remain undetected. The guerrillas were taken by complete surprise, and by 7:50 the South Vietnamese troops were on the ground engaging the enemy. One minute later the fighter planes were delivering air strikes on targets spotted from ground observation

posts and from an observation plane circling above.

Friendly reinforcements began arriving at 8:15 to bolster the committed units, which had surrounded the guerrillas. By 8:35 the South Vietnamese troops had closed with and annihilated the enemy.

* * *

Army Aviation Operation in Vietnam

Lieutenant Colonel Thomas J. Sabiston, Ret

How can Army Aviation help bring about a successful conclusion to the operation in South Vietnam?

Simple, one might answer: just provide the type of support outlined in the fictitious news story presented above.

There is no reason that immediate or preplanned Army Aviation operations in South Vietnam cannot be as efficient and successful as the one depicted in our "news story."

But *achieving* such a degree of success in both combat and civil flight operations in South Vietnam is not so simple. Innumerable problems exist that can only be hurtled by those fully capable of operating and flying in South Vietnam's counterguerrilla warfare environment.

Col Sabiston was a Senior Army Aviator, dual rated and instrument qualified.

To ensure the successful role of Army Aviation in South Vietnam, *all* personnel in the program must be *fully* qualified in aircraft they are expected to fly; they must acquire a degree of proficiency reached only by understanding what their contemporaries on the scene are experiencing. Operational experiences faced daily in South Vietnam will be discussed here to help provide sound advice to use in the development of employment doctrine, tactics, techniques, and training programs.

ARMY AVIATION'S ROLE IN SOUTH VIETNAM

It would be detrimental to the national interests of the United States if Communist inspired and supported insurgents succeed in overthrowing the western-oriented government of South Vietnam.

Consequently, the U. S. has supported the Army of South Vietnam (ARVN) with military equipment and advisory personnel, and more recently with U. S. Army Aviation units.

Army Aviation's mission in South Vietnam is to train ARVN units and when needed to provide the ARVN with mobility, communications, and control superior to that of the Viet Cong. A secondary mission is providing administrative support, usually for military advisory group training teams.

TERRAIN, WEATHER AND ENEMY ACTIVITY

South Vietnam is divided into three major regional areas according to terrain, weather, and guerrilla activity.

Vast mountain ranges which exceed elevations of 10,000 feet span the northern part of the country. The area consists mostly of uninhabited jungle with only a few poor roads. The rainy season lasts from September through January. Viet Cong activity is occasionally heavy, but usually light to moderate.

The central portion of the country consists of rough mountain ranges along the coast and a sprawling plateau to the west. Top elevations in the mountains are 8,000 feet and range from 1,000 to 3,000 feet on the plateau. Here again most of the terrain consists of jungle with only a few poor roads. The rainy season and Viet Cong activity are the same as in the northern part of the country.

The southern part of South Vietnam consists mostly of river deltas, with a mean elevation of 20 feet. Although some jungle exists, the majority of the countryside is used to grow rice. Roads are numerous but poor. The rainy season lasts from May through September. Viet Cong activity is continuously heavy.

Terrain features change rapidly throughout South Vietnam. What appears to be a canal on the map might actually be a dry ditch, or it might be unidentifiable if rains have flooded the area. The rapid rise and fall of streams and growth of vegetation quickly make aerial photographs obsolete.

ENEMY TACTICS

The Viet Cong might be described as ever present, but they are elusive and fleeting to a degree as to be almost invisible. They possess mostly small arms, including a few automatic weapons such as .30 caliber machineguns and BARs. Many of their weapons are homemade and have a very short range.

Most Army aircraft hit to date by the Viet Cong have been hit by a single round of small arms fire, which inflicted minor damage. In a few cases aircraft have suffered multiple hits from automatic weapons.

Operating mostly at night, the Viet Cong employ hit and run tactics similar to those used by guerrillas in Europe in World War II. When trapped, the guerrillas' tactic is to pick a weak point in the advancing line and make an effort

to penetrate and escape in a direction not anticipated by their attackers. If successful, they soon scatter and cannot be distinguished from the average, loyal South Vietnamese citizen.

The guerrillas depend on the local populace for food, shelter, and intelligence. They obtain cooperation from the people through numerous techniques, ranging from friendly assistance and promises to terrorism, murder, and plunder.

FLIGHT ROUTES TO THE OBJECTIVE

Numerous flights over the limited number of access routes to an objective soon reveal its location to the enemy. This enables him to concentrate fire on helicopters, both in the landing zone (LZ) and on the approaches.

One helicopter unit in South Vietnam learned early that its helicopters could generally not traverse the same terrain more than twice without being hit by ground fire. During one operation the unit's helicopters flew to the objective by one route, returned for pickups by a second, and then flew back to the objective and returned by entirely different routes. No ground fire had been received to this point.

However, each time the helicopters passed over a new corridor, the Viet Cong (posing as average farmers) alerted one another and uncovered their weapons. No virgin routes remained for the third trip in, and the Viet Cong were ready, trying to bring down the helicopters with small arms fire. A helicopter disabled in the LZ can disrupt an entire operation, since most LZs in the northern portion of the country can accommodate only a few helicopters at a time.

To avoid such situations, units in South Vietnam try to effect maximum airlift in as few flights as possible.

CONTOUR FLYING

One unit in the central portion of South Vietnam reports that contour flying over jungle terrain offers the best security for helicopter movements. The vegetation limits the guerrillas' visibility and field of fire. The report adds that a lack of outstanding terrain features in the jungle makes pinpoint navigation extremely difficult while contour flying. A practice of having the lead helicopter occasionally "pop up" 200-300 feet for orientation proved unsatisfactory. But when a fixed wing observation plane is used to mark routes and landing zones, navigational accuracy is achieved.

A unit from the southern part of the country reports that it has adopted contour flying as policy, but adds that it is only used in the final phase of the flight. Contour flights over the entire route have been abandoned in lieu of high altitude flights for several reasons:

- The surprise desired can be obtained by descending only for the final phase of the flight.

- Exposure to small arms fire increases in contour flying in an open country.
- Navigation is extremely difficult, or impossible, without the assistance of a control aircraft flying at a higher altitude.
- The added strain of contour flying on the pilot is great.

The report adds that under current conditions flying at altitude and making the final approach at contour with the aid of a control aircraft is the best technique for that unit.

A helicopter company in the northern part of the country reports that to achieve surprise it also uses the system of flying at altitude and descending during the final approach. The advantages and disadvantages reported are essentially the same as those listed above.

Use of control airplanes allows helicopter crews engaged in low-level flights to concentrate on aircraft control and their cargo and/or troops; to closely monitor the critical timing sequence; and to guard against possible confusion within the air column at the objective area. Laxity in any of these areas could cause complete failure of the mission.

Control planes should have a speed capability well above that of the helicopters, but they should still be able to slow to the helicopters' pace. They should possess a capability to mark LZs and be flown by an aviator from the helicopter unit involved or by one intimately familiar with the operation.

In addition to guiding helicopters, the control aircraft can also:

- Advise helicopter flights of activity on the ground prior to landing.
- Inform ground commanders of the Viet Cong's escape routes, and advise the helicopter serials following of new landing sites to cut off the escape.
- Relay information on the operation to the controlling commanders.

FORMATION FLYING

Formations must allow a maximum of command control and permit all aircraft to pass a given point in a minimum of time, thus denying the Viet Cong a chance to get their weapons and fire at trailing aircraft. To change altitudes in formation, power changes must be made in lieu of cyclic climbs or descents.

A vee formation of 3-5 aircraft has been the most satisfactory of those used to date, but an echelon formation of no more than five aircraft also can be used. A trail formation is least satisfactory, since it requires all aircraft to pass over a given point.

To keep a formation properly closed, the flight leader must carefully monitor release points, checkpoints, turning points, and airspeed. If radio silence is not in effect, the pilot in the rear aircraft assists the leader by informing him of the formation's condition.

One unit has had great success by having a control aircraft overhead alert the flight when it was approacing the LZ. This eliminated last minute notification of the pilots and the need to execute a difficult deceleration flare to come to a hover with a full load. If a control plane is not available, the flight leader must give ample warning of the approach to the LZ.

THE LANDING ZONE

Aerial reconnaissance and photographs of landing zones near objectives are desirable, but often are difficult to obtain. The nature and speed of guerrilla warfare does not always permit time for aerial reconnaissance. Also, the Viet Cong are overly suspicious and a routine flyover can make them vanish in seconds.

Consequently, a map reconnaissance of the landing zones is accomplished before the mission. Since available maps are outdated and frequently inaccurate, it is often necessary for a flight leader to select new LZs when the flight arrives in the objective area. This means an interpreter must be carried on each flight to keep the Vietnamese airmobile commander informed of changes.

An important factor to consider in the selection of an LZ is the vulnerability of the helicopter on the ground. It is extremely dangerous to land directly on the objective area where known enemy ground fire will occur and where no aerial suppressive fires are employed. Other factors to consider are the approach and departure routes, which must be compatible with the wind and tactical situation.

One unit reports that it dispatches a "scout" helicopter to the LZ in advance of the main body. The scout marks landing zone areas with smoke, which also reveals wind direction and possible flight routes. It remains in the area during the operation as a rescue aircraft and for radio relay.

In most cases terminations of approaches to LZs must be at a hover. Even in well reconnoitered areas the terrain is treacherous, consisting of water coverage and hard surface with mud beneath.

AIRCRAFT WEIGHT REDUCTION

High density altitudes in South Vietnam and the need to operate at near maximum gross weight make it necessary to lighten the CH-21 by removing various items of equipment. The following items were removed from one unit's CH-21s and did not detract from operational needs or flight characteristics.

Omnirange set (when not needed)	17	pounds
Cabin heater and blower	68	"
Litter straps and brackets	20	"
Rescue door	38	"
Cabin insulation and soundproofing	45	"
Troop seats and safety belts	40	"
Main cabin doors	52	"
Misc.	18	"
TOTAL	298	pounds

Removal of the seats facilitated the loading and off-loading of troops, and eliminated the problem of weapons becoming entangled in the canvas web backs.

COMMUNICATIONS

The absence of enemy air activity decreases the need for air traffic regulation and identification in combat operations. Flight following service is very much needed and is used on a limited but inadequate scale. Usually when a helicopter is beyond line of sight of the control tower, radio contact is lost.

Army helicopters in South Vietnam are not IFR equipped; nor are the majority of the Army Aviators instrument qualified. Consequently, few combat missions have been flown at night, except during bright moonlight.

An aircraft communications problem exists in South Vietnam due to the incompatibility of radios among control aircraft, transport helicopters, and South Vietnam Air Force fighter aircraft. Also, ground unit radios have limited range, and contact with ground commanders has at times been inadequate due to a lack of information on frequencies and call signs.

LIAISON

The practice of having liaison officers (LOs) work directly with the supported unit has proved most effective in South Vietnam. The responsibilities and duties of the LOs go far beyond those normally included in liaison duties. For this reason selection of LOs is not made on a duty roster basis. Only the best qualified and experienced officers are chosen. Availability of such officers is maintained by assigning inexperienced officers as assistants to those who are experienced.

Before a pending mission, two LOs accompany the helicopter unit commanding officer to the unit to be supported. The first meeting (usually at division level) includes aerial reconnaissance of the objective (if possible) by the LOs and division staff personnel. Potential landing sites, approach routes, and checkpoints are tentatively selected at this time.

The LOs are not responsible for tactical matters, but often are involved and consulted due to a lack of ARVN staff personnel experienced in tactical employment of helicopters. When a plan is finalized, the LOs return to their unit. They then help coordinate refueling requirements, messing arrangements, medical support and the like. During the execution of the mission, one LO directs the flight while flying above and behind the helicopters. The other flies in the lead aircraft.

THE TRAINING PROGRAM

The best way to ensure that Army Aviation is properly employed in South Vietnam is to conduct a sound training program for the South Vietnamese soldier, his commanders at all echelons, *and* U. S. military advisors.

Many ARVN troop commanders and even some U. S. military advisors are unaware of the capabilities of aircraft. All they know is that they have a mission, so many troops for the job, and the use of helicopters that will go "straight up and down." They do not realize that other factors must be considered—wind, weather, distance, condition and size of the pickup and landing sites, density altitude, gross weight of the aircraft, temperature, barriers to takeoff and approaches, etc. This problem is being solved through continued use of liaison officers who point out these factors and occasionally turn down a mission due to one or more of these unsatisfactory conditions.

Training of individual combat soldiers in airmobile tactics also has been most helpful. For example, troop loading and unloading has presented very few problems—thanks to a sound training program.

Many lessons are learned from experience. When helicopter company commanders objected to making numerous flights over the same routes, they were basing their objections on experience. At first, some ground commanders felt the objections were made solely for self-preservation. However, experience soon taught them that if a helicopter was disabled in an LZ, they might find themselves with a lesser force to secure or defend an objective.

The training program has often proved tedious and time-consuming, but it has paid handsome dividends.

AIRCRAFT MAINTENANCE

Each helicopter company in South Vietnam is supported by a third echelon helicopter maintenance detachment. Additional backup is provided by a transportation aircraft DS company. Fourth and fifth echelon maintenance is provided by civilian contract. Both organizational and field

maintenance have been generally satisfactory to date.

Avionics maintenance is provided by detachments that have been specifically organized for deployment to Southeast Asia. They have proved themselves capable of performing field maintenance on all avionics equipment used by Army Aviation in South Vietnam.

UNITY OF COMMAND

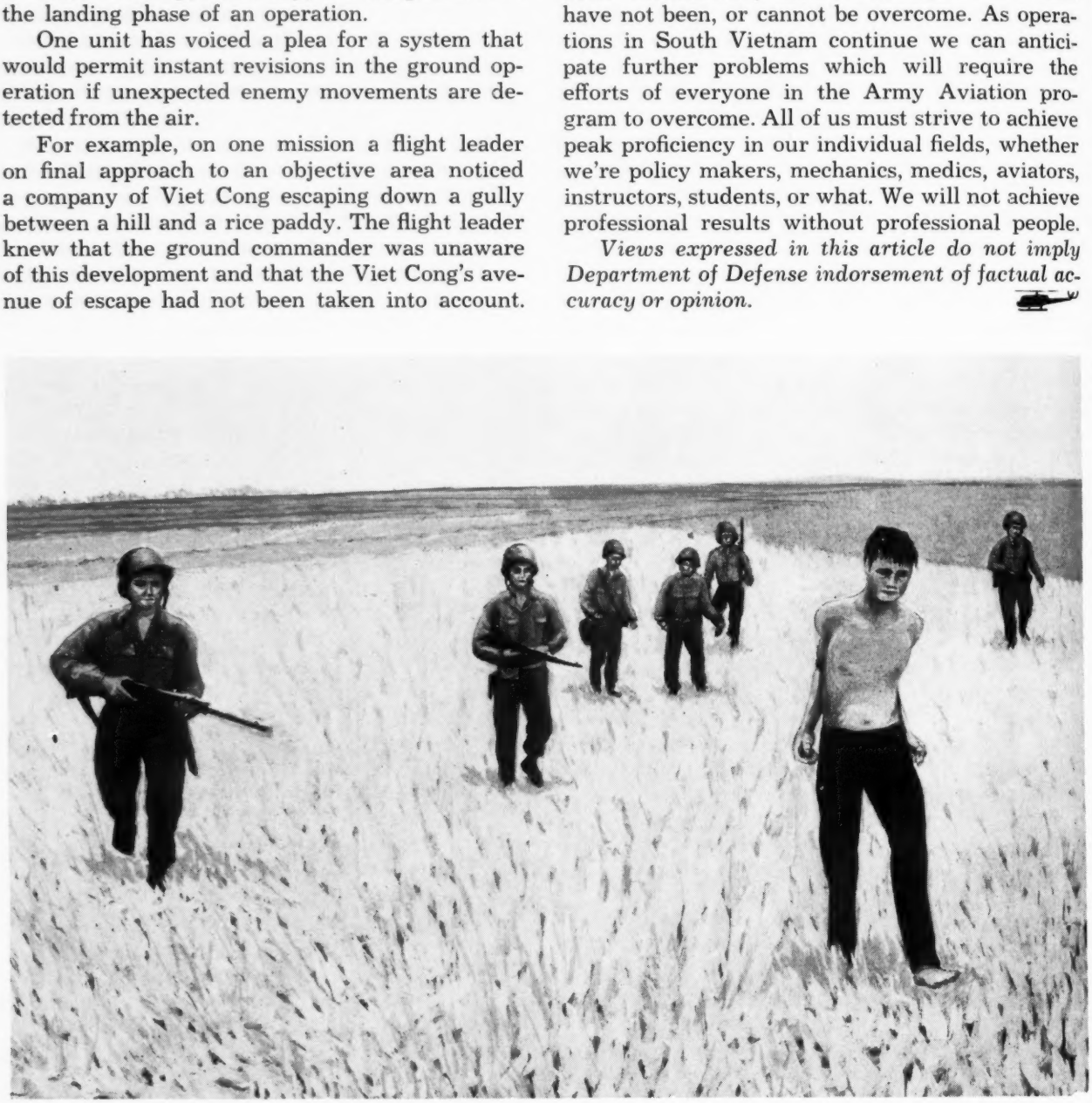
The most critical portion of each heliborne operation occurs in the landing zone. Comprehensive preplanning will be meaningless if there is a lack of unity, flexibility, and cooperation in the landing phase of an operation.

One unit has voiced a plea for a system that would permit instant revisions in the ground operation if unexpected enemy movements are detected from the air.

For example, on one mission a flight leader on final approach to an objective area noticed a company of Viet Cong escaping down a gully between a hill and a rice paddy. The flight leader knew that the ground commander was unaware of this development and that the Viet Cong's avenue of escape had not been taken into account. Due to the incompatibility of radio communications equipment, he was unable to contact the ground commander or fighter planes in the area. Since he did not have the authority to revise the tactical plan, the flight leader had to place the troops into the preplanned LZ. The operation continued as scheduled and was termed a success . . . but the "patient" escaped.

The paragraphs above have established that Army Aviation operations in South Vietnam materially add to the success in the operations against the Viet Cong. While many obstacles have been encountered, there have been none that have not been, or cannot be overcome. As operations in South Vietnam continue we can anticipate further problems which will require the efforts of everyone in the Army Aviation program to overcome. All of us must strive to achieve peak proficiency in our individual fields, whether we're policy makers, mechanics, medics, aviators, instructors, students, or what. We will not achieve professional results without professional people.

Views expressed in this article do not imply Department of Defense indorsement of factual accuracy or opinion.



EJECTION SENSE

Barney A. Roth, Jr.

DURING THE PAST summer, a Mohawk pilot was flying straight and level at 1,400 feet. For reasons still unknown, the aircraft was seen to pitch up, make a steep turn to the left, and dive into the ground. Both pilot and crewchief ejected before impact. *Because of the dive attitude and relatively low altitude,* the ejections were unsuccessful and both pilot and crewchief sustained fatal injuries.

The pilot's ejection seat deployed drogues and released the shackle, but there was insufficient time or altitude for the main parachute to deploy fully. This ejection was within a fraction of a second of being successful. The crewchief's seat deployed drogues, but it did not have shackle release.

Two months later, another Mohawk pilot was making an approach to a field strip. He overshot and started a go-around. When full power was applied, the left propeller feathered (due to an improperly set torque pressure switch) and directional control was lost. Just before the left wing struck the ground, the pilot ejected. The seat sequence was perfect, with drogue deployment and shackle release, but neither time nor altitude was sufficient for the main chute to blossom. Again, a split second would have made the difference between life and death.

These examples are hard, cold facts. The Martin-Baker seat was designed to do a specific job: save lives. But it can only do this job within its operating limits.

Three main factors determine success or failure for ejections:

ATTITUDE
AIRSPEED
ALTITUDE

If the aircraft is headed for the ground during ejection, the seat will move toward the ground; if the aircraft is pointed up, the seat will go up. THE SEAT WILL FOLLOW THE FLIGHT PATH OF THE AIRCRAFT.

Continued on page 28

Mr. Roth is Air Safety Investigator with the United States Army Board for Aviation Accident Research.

Skycon Training

Captain Ralph W. Broman

THE NEED FOR specialized training for both aviators and observers in low-level helicopter reconnaissance is fast becoming a necessity at unit level. But how, where, and when will our present reconnaissance helicopters be used?

Despite protestations to the contrary, the major use of reconnaissance helicopters is for command liaison. Sporadically, the helicopter is assigned a reconnaissance mission, but chances are the aviator is assigned on a mission basis only and has few if any skills in accomplishing an effective reconnaissance. Commanders are notably reluctant to assign missions to light helicopters beyond the front line positions, and lack of imagination has habitually relegated the OH-13 helicopter to command taxi and casualty evacuation missions. The time has come for a more serious look at the commander's use of aerial reconnaissance and to provide him with a usable system for the employment of organic helicopters in this role.

Future organization of aviation at division level will use helicopters almost exclusively. A major portion of the division assigned aircraft will be the LOH, or light observation helicopters, a number of which will be assigned to the reconnaissance troops and squadrons. More sophisticated enemy antiaircraft missile systems and detection radars plus the increased presence of enemy aircraft in the future indicate that Army Aviation must learn to live at treetop level. Much lip service has been given to nap-of-the-earth reconnaissance but, as yet, very little doctrine is in the commander's hands of how to employ reconnaissance helicopters at low-level.

The problem of efficient and responsive use of aerial reconnaissance was recently tested by the Aviation Section, XVIII Airborne Corps, and attached personnel from the 82d Aviation Battalion, Fort Bragg, N. C. The results of this testing were demonstrated to the Commanding General, XVIII Airborne Corps and subsequently adopted for training.

Basically, the doctrine prescribes that specialized teams of two OH-13 helicopters with assigned aviators and observers would be concurrently trained in low-level aerial reconnaissance. These teams have been designated SKYCON teams to identify them as specialists in nap-of-the-earth reconnaissance. Subsequently, the teams would be placed on orders and assigned exclusively to aerial reconnaissance training missions. The current availability of OH-13 helicopters precludes exclusive use of helicopters for reconnaissance missions during garrison duty. However, these teams will be assigned on field exercises, maneuvers, and command post exercises whenever practical.

At least three teams of six helicopters, six aviators, and six observers have been trained by the 82d and 101st Airborne Divisions. The main source of observers is the armored cavalry troop (reconnaissance). The overall availability of reconnaissance helicopters will dictate the number of SKYCON teams to be used. At all times at least one SKYCON team will be available.

SKYCON teams should be tested periodically (recommended every four months) with a mission type problem similar to an ATT. At the same time, SKYCON team records should be inspected for current orders and utilization of teams during the last 4-month period. Results of these tests should be forwarded through command channels and include a recommendation as indicated.

The following doctrine is currently being used for training SKYCON teams in the 82d and 101st Airborne Divisions.

ORGANIZATION AND CONTROL

SKYCON teams normally consist of two reconnaissance helicopters, two aviators, and two observers.

The two reconnaissance helicopters comprising the SKYCON team should be equipped with single controls. One set should be on the right side in one helicopter, and on the left in the other. (In lieu of helicopters with single controls on right side, a dual aircraft should be used.) This will allow the observers to sit on opposite sides, thus giving the SKYCON team a 180° arc of observation. The aircraft with the controls on the right should also have the

---

Capt Broman was with the Aviation Section, XVIII Airborne Corps, Fort Bragg, N.C., when this article was written. He is now with 22d Special Warfare Aviation Detachment, Fort Bragg.

compass on the right and a floor mike button on the left for the observer. Both aircraft should eventually be equipped with directional gyroscopes and artificial horizons to aid in low-level navigation and night flying. The top surfaces of the rotor blades and stabilizer bars should be painted an irregular camouflage color to minimize reflections during flight.

A .45 cal. submachinegun is mounted on the right side of the cockpit, and a survival kit is mounted on the firewall between the seats. A mount is attached to the radio console to hold two steel helmets. Two 5-gallon containers can be mounted on the sides of the helicopter for emergency refueling. In the future, bomb shackles will be mounted on both skids, as well as .30 cal. machinegun armament.

Lack of the above equipment does not preclude the establishing of SKYCON teams. Such equipment is suggested as a guide for equipping helicopters, and in many instances is not currently available. The equipping of these teams, both to diversify their missions and to survive on the battlefield, is limited only by the imagination of the commanders concerned.

CONTROL

SKYCON teams will normally be under the operational control of the G-2. They may be attached or assigned either to reconnaissance elements or other combat units, depending on their mission. They will normally be located either in the vicinity of the division CP or at the division base airfield, if retained under the control of the G-2.

TRAINING

Aerial observers should be noncommissioned officers with the following qualifications:

Class I physical profile, diversified experience in basic combat branch, desire to fly, and retainability of at least one year after training.

Quotas for SKYCON observer training should be based on two per authorized TOE observer position. When unit has organic or direct support reconnaissance helicopters, these aviators will be assigned to the school and will take this training as a team with the unit observers. In all cases, the observer will train with the same aviator throughout the schooling period.

Training will emphasize the following subjects:

SKYCON tactics	2 hours
Observation	4 hours
Survival	2 hours
Communications	1 hour
First aid	2 hours
Low-level navigation and orientation	4 hours
Total Ground School:	15 hours

Observation at low level is comparatively easy. The main training problem is to discipline the observer to scan from a 45° to a 90° angle from the nose of the aircraft. This angle provides a better view of the terrain. Fixating straight ahead or at defined objects must be avoided.

SKYCON team training will be broken down into four basic phases over a period of approximately 3 weeks. The suggested number of hours for each phase is provided as a guide only and can be modified to meet the requirements of local commanders.

- *Helicopter confidence course.* This course is designed to give the rotary wing aviator confidence in flying at low levels. Such a course should be planned to use available terrain and be approximately 30 minutes in duration. This course should be flown each morning of the SKYCON training period before formal training, and should be scheduled on a systematic basis for all rotary wing aviators.
- *Aviator/observer ground reconnaissance training.* Ground instruction to incorporate the subjects listed above will be given during the first week. Preliminary training in low-level observation should be given, employing slides exposed for short durations to accustom the observer to pick up objects that would be seen for only short periods of time. Low-level motion picture film produced at a local level is also useful in adapting observers to low-level environment.
- *Aviator/observer low-level flight techniques and navigation.* Instruction must first be given in SKYCON flight signals and purely navigational problems before tactical training missions can be attempted. This training should last approximately 3 days to 1 week, including night flying, and should be given during second week.
- *Aviator/observer tactical reconnaissance training.* The last week of training incorporates all previous training as applied to tactical reconnaissance missions. This training should be coordinated with tactical ground units wherever possible.

COMMUNICATIONS

A separate FM aerial intelligence net should be established to make the SKYCON teams more responsive to intelligence agencies. Besides the SKYCON teams, any aviator may enter this net to make spot intelligence reports. This net will normally include the G-2, the G-2 Air (Division Base Airfield), the SKYCON teams, designated reconnaissance or other combat units, designated surveillance aricraft (dependent on mission), and FDC.

To minimize communications as much as possible, a series of

numbered and lettered signals has been devised to indicate basic formations and maneuvers. They are as follows.

Echelon right or left (Radio call: One right or left). This formation is used a majority of the time since it allows unrestricted vision forward and to the sides while not exposing both helicopters at the same time to enemy action. The lead helicopter flies at a slightly higher altitude, since he must do most of the navigation.

On-line right or left (Radio call: Two right or left). This formation is used when maximum observation is needed to the front. It is also used when firing from defilade bobbing positions.

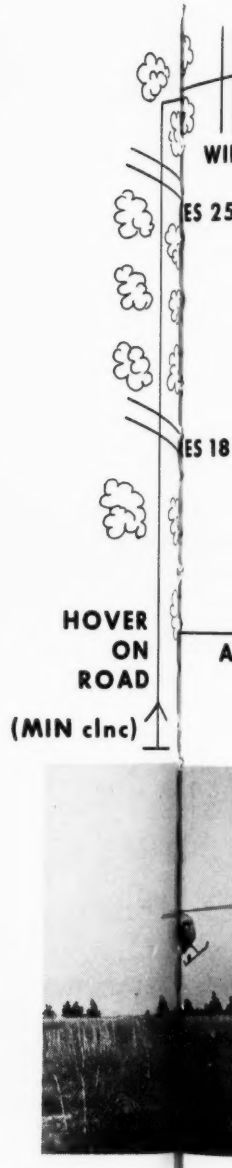
In-train (Radio call: Three). This formation is used when passing through narrow defiles, such as ravines, rivers, etc. It is also used to take full advantage of defilade positions.

Hi-Low (Radio call: Four or four alpha). This maneuver can be done from any of the above formations. The lead helicopter makes a sharp cyclic climb to momentarily see over obstacles, clear wires, or for re-orientation. This is followed by a rapid descent to treetop level. As soon as the lead helicopter is down, the trail helicopter repeats the same maneuver. A "Four alpha" is one in which only the lead aircraft climbs.

The trail aircraft orbits or holds while the lead aircraft investigates sighting (Radio call: Five). A modification of this maneuver is "Five alpha" which indicates that the lead helicopter will land and investigate.

This maneuver is an alert when enemy action is encountered (Radio call: Six). Both helicopters will head for the nearest friendly area immediately by separate routes. A modification of this maneuver is "Six" followed by a checkpoint, indicating that aircraft will rally at designated checkpoint.

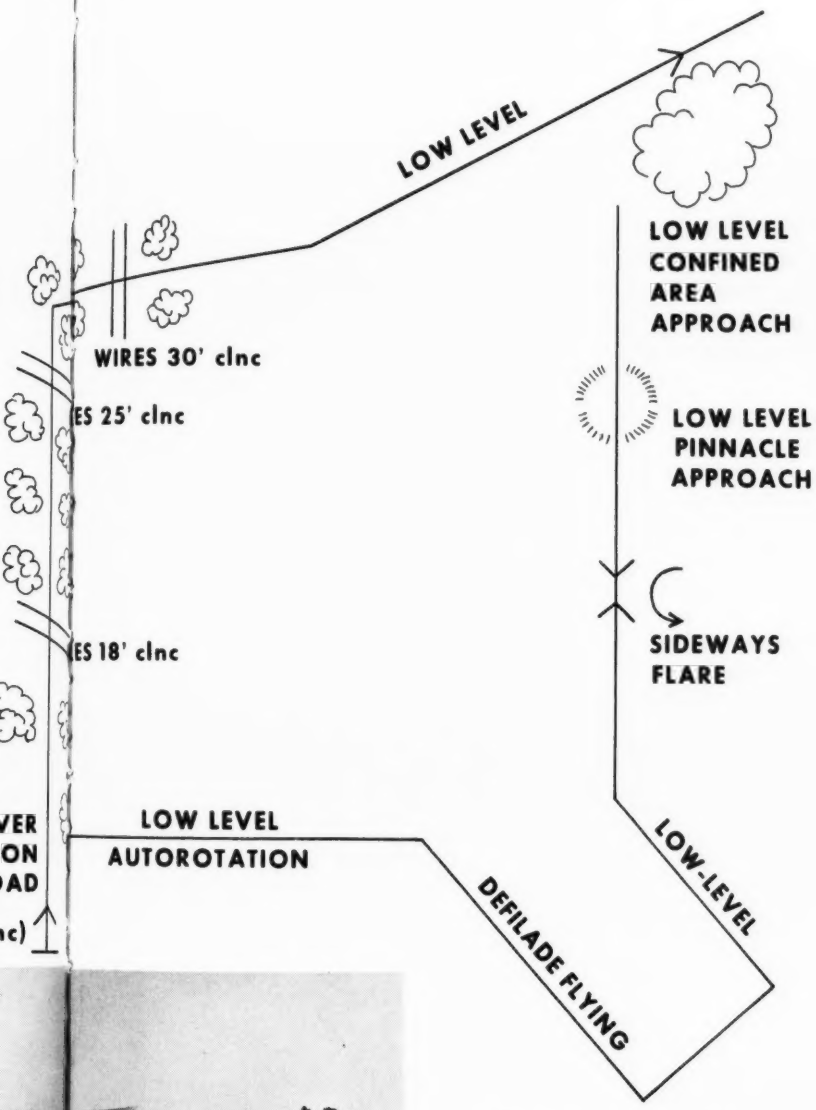
This maneuver indicates that both aircraft will land and disperse immediately (Radio call: Seven, seven alpha, or seven-(number). A modification of this maneuver is "Seven alpha," which indicates that attacked aircraft will use evasive air maneuvers while the other aircraft



will separate and land. "Seven" followed by another number indicates both aircraft will land for a given number of minutes.

Right or left (Radio call: Eight right or left). This maneuver is a 180° opposite turn by both helicopters, and is used to recheck sighting or to reverse course. Right or left is given to indicate which direction the lead helicopter is turning so that the trail helicopter will turn in the opposite direction.

All transmissions from helicopter to helicopter are answered with two clicks of the mike button only. Normal radio procedure is used when calling any ground station. Emergency or detailed instructions are given



This helicopter confidence course is a guide for establishing such a course at local level. It may be modified to suit available terrain but should contain the type obstacles listed.

in the clear. Transmissions between SKYCON aircraft are preceded by only the call sign of the aircraft being called. (Example: "Bravo, one left.")

Movement by bounds can be done from any of the three formations by adding "by bounds" to the formation signal. The lead helicopter will come to a hover or orbit in a defile or concealed position while the trail helicopter passes and searches. The by-bounds distance is more extended if helicopters are unarmed and is used most often in conjunction with ground reconnaissance units for flank and forward observation. Armed helicopters will stay within the range of covering fires of the holding aircraft.

EXECUTION OF MISSION

SKYCON teams will normally fly nap-of-the-earth reconnaissance. This is necessary to avoid detection by enemy observation posts, radar, and enemy aircraft. The higher the aircraft, the farther it can be detected. This does not eliminate observation from a higher altitude, but such flying should be attempted only when there is no other way to accomplish the mission, and be governed by the enemy potential for detecting SKYCON teams. Normally, a flight route will not be reflown during a mission due to the already alerted enemy situation. Again, the priority of the mission may dictate that certain areas be rechecked. But the risks of such decisions must be understood.

Aircraft in the SKYCON team will be lettered "Alpha" and "Bravo." Alpha aircraft will contain the most experienced aviator and observer and will be in command of the SKYCON team, regardless of rank. SKYCON teams will be briefed every three hours on the enemy situation. In addition, they will habitually check the intelligence map and be familiar with the front line trace, the locations of major command posts, the enemy order of battle, the range and location of enemy and friendly supporting fires, the enemy air situation, and daily patrol routes. This will allow them to be dispatched with minimum delay.

Careful flight planning is essential to the success of the mission. Besides the flight plans required by flight operations, an intelligence flight plan overlay will be left with the G2/S2. A SKYCON overlay will normally be attached to the intelligence map. This overlay will show three colored areas as follows:

Green, enemy contact remote; yellow, enemy contact possible; red, enemy contact probable. This overlay will be kept up-to-date by the G2/S2 and will be used to brief and debrief all aviators. The G-2 Air representative will normally be located at the division airfield. Upon receipt of a mission, the SKYCON teams will plan their initial flight paths and formations based on the colored areas they will be flying, and the terrain. Amount of time spent in the red area must be minimized consistent with accomplishment of the mission. Flight paths and checkpoints will be placed on the SKYCON overlay with a selected IP time. G2/S2 will coordinate these flight paths with FDC of Divarty to provide for the necessary shifting of fires.

It proved more practical to have FDC monitor the aerial intelligence net to keep track of the location of SKYCON teams. IP will be crossed within one minute of estimated time of arrival. Each checkpoint will be a position report to the G-2. This report will be the letter of the checkpoint followed by the minutes past the current hour that the team passed over this point. (Example: "Alpha, 32.") These position reports will be plotted on the SKYCON overlay so the G2/S2 knows the location of these teams at all times and can divert them to a higher priority mission, if necessary. The G2/S2 will also indicate what information will be reported by air and to what agency, and what information will be obtained at the debriefing.

Maps carried by the SKYCON teams will carry no military symbols or other information of intelligence value. Only selected routes and checkpoints will be used.

Teams will be equipped with target marking smoke bombs. A color code for different days will be used and targets of opportunity will be marked so that they may be brought under fire by either surveillance aircraft or ground observation posts.

Three general types of reconnaissance missions are used:

- The point reconnaissance is used to gather information from predesignated coordinate locations. If this point is in a yellow area, the high-low orbit will be used. In this maneuver the lead helicopter will fly a tight low-level orbit to the left, keeping the observer on the inside of the turn. The trail helicopter will fly a wider orbit at 200 feet to the right, again keeping the observer on the inside of the turn. If a point reconnaissance must be made in the red area, the SKYCON team will make a one-time pass of the area and continue on. Teams will pass only as close to the point to be reconnoitered as needed to accomplish the mission.
- Route reconnaissance is used both to evaluate routes and to detect enemy movements. The echelon formation is best for this

mission since both aircraft can fly astride the road while not exposing both aircraft at once to unexpected enemy action. The "one left" formation is recommended since both observers would be facing in towards the route.

• Area reconnaissance should be limited to small defined areas being searched for specific information. Low-level flight limits the amount of area that can be effectively searched. The pattern will not be geometric and will be planned according to the terrain. Corners of the search area will be bounded by checkpoints of recognizable terrain features whenever possible. Aviators will alter their flight paths to take advantage of all defiles and concealed routes.

If one aircraft is lost, the surviving aircraft will report the location, time, and possible casualties to G-2. If possible, he will attempt a rescue. If not, he will orbit the area to guide and assist rescue aircraft. If neither are possible, he will determine if he can continue the mission and so advise G-2. In cases where no immediate rescue is possible, the downed aviator will attempt to reach his nearest checkpoint for pickup. If this checkpoint is in enemy control, he will proceed until he finds a checkpoint where rescue may be attempted. If both aircraft are lost, the G-2, after a one hour wait, will initiate a search from the location of the last position report.

Although reconnaissance is the primary mission of SKYCON teams, specialized missions can be undertaken. The value of SKYCON teams is directly proportionate to the commander's initiative. The following specialized missions are suggested:

Limited War:

Nuisance mine fields. In situations where there is no defined front line, antipersonnel mines could be carried in bomb containers on the shackles and used to set up nuisance mine fields along patrol routes, roads, etc. Certain areas could also be booby-trapped by the SKYCON team observer being dropped in an area and picked up later.

Demolitions. Bridges can be blown and other obstacles created.

Ground observation posts. SKYCON observers can be dropped onto areas for specific periods and then picked up to allow sustained observation.

Enemy material analysis. SKYCON teams can land and analyze or confiscate abandoned enemy material and documents.

Interrogate refugees. In pursuit operations SKYCON teams can land and interrogate indigenous personnel.

General:

Radiological survey.

Target marking. Colored smoke bombs carried daily, using a different color designation each day, would be used to mark targets of opportunity so that indirect fire may be adjusted on these targets by either ground observers or surveillance aircraft. It is not advisable for SKYCON teams to interrupt missions to adjust fire.

Smoke, chemical agents, and napalm. Standard bomb shackles attached to the skids of the helicopter can carry standard smoke dispensers or locally produced napalm containers.

Night reconnaissance. Using radar vectoring, SKYCON teams can be guided over predetermined enemy positions and drop flares to reconnoiter specific areas.

CONCLUSION

As soon as SKYCON teams are trained in the 82d and 101st Airborne Divisions, they will become operational for field training. The knowledge gained from their utilization under field training conditions will undoubtedly lead to changes and refinements in the doctrine presented in this article. However, the need for specialized aerial reconnaissance teams in combat is a reality now. The U. S. Air Force, as well as the air forces of other countries, has long realized that reconnaissance is a specialized, full-time occupation. The time has come for the U. S. Army to realize that if it is to gain a full intelligence dividend from Army Aviation, it must invest now in SKYCON.

SURVIVAL EQUIPMENT

The following items are suggested for a type survival kit to be installed in SKYCON helicopters. These items are recommended as a guide for the SKYCON teams and may be modified at local level. Total weight of this kit is approximately four pounds excluding the ration, which is an additional one pound and is carried in the -10 pocket.

1. Waterproof matches, flint, and tinder in waterproof can
2. Jackknife
3. Heating tablets
4. Water purification tablets
5. Small animal snare
6. Fishing kit
7. Sunburn ointment
8. One man six day ration (AF SA-6)
9. 10 ft nylon cord
10. Whistle
11. Splint
12. Canvas case
13. Day and night flares (2)
14. Signalling mirror
15. Survival manual (AF AAF 64-0-1)
16. Compass
17. Waterproof bag and candle

Continued from page 21

A successful ejection can be made at ground level, provided the aircraft is flying straight and level or in a wings-level, nose-up attitude, with an airspeed of at least 90 knots.

The chart shows how attitude and airspeed determine minimum altitudes for successful ejection. With a 50° pitch-down attitude and airspeed of 130 knots, the lowest altitude for successful ejection is 400 feet.

Air Force experience indicates that 40 percent of all ejection fatalities are preventable. The biggest problem is delaying the decision to eject until reaching altitudes too low for success. This type delay was apparent during the Mohawk accident described in the first paragraph.

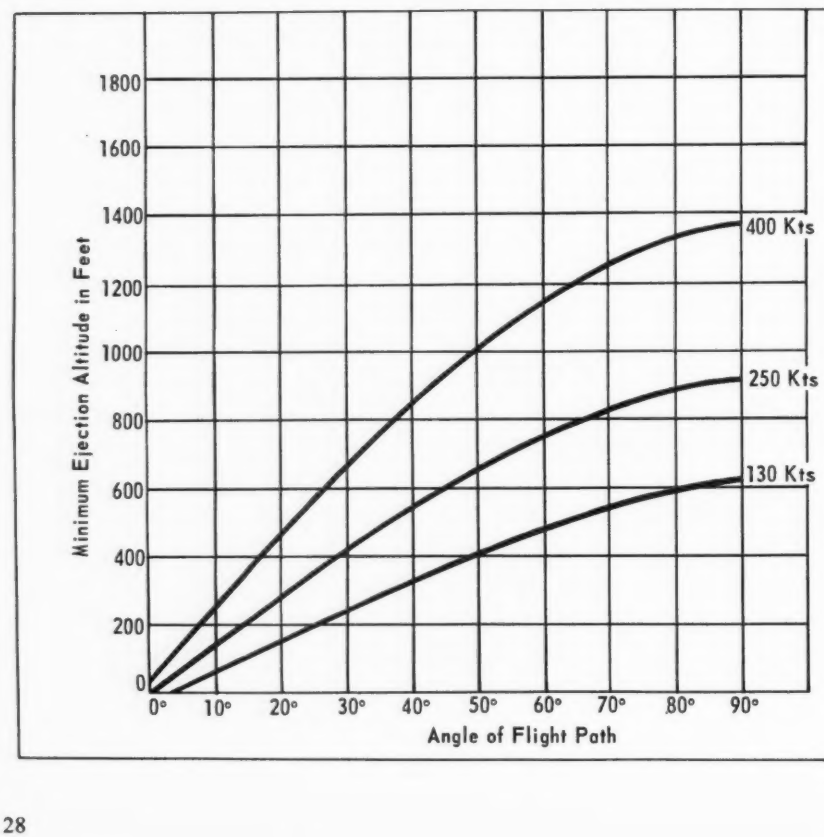
What causes delay? Often, it can be traced to uncertainty. And the best way to eliminate uncertainty is to gain a full understanding of the equipment and how it operates, its capabilities and limitations. A complete knowledge of the ejection seat and continuing mental drills of emergency procedures will prepare you to make the right decision in the least possible time for any emergency.

The Army Aviator should do his utmost to stay proficient in the entire operation of the seat. He should know and practice the use of the manual escape system. As the infantryman is able to disassemble and reassemble his rifle under all conditions, day or night, the person sitting on a Martin-Baker seat should know emergency procedures by instinct. Once the emergency happens, it's too late to start learning.

Simply because most of our flights are over land is no indication we may never have to eject over water. Do YOU know how to escape from the parachute harness while trying to stay afloat? How to control a parachute during descent? How to turn around? How to land? These are a few of the items the many qualified jumpers in the Army can teach you.

The difference between life and death during an ejection is sometimes a fraction of a second. You can get on the right side of this fraction if you . . .

KNOW YOUR EQUIPMENT
KNOW WHEN TO USE IT
KNOW HOW TO USE IT



Minimum Ejection Altitudes

Drogue Gun Delay	½ sec.
Time Release Delay	1½ sec.
G Stop Mechanism Set At	4 G
Ejection Velocity (Tel. Gun)	83 ft./sec.
Ejected Weight	320 lb.
Installation Angle	65°

NOTE:
Altitudes shown were calculated from the time of gun initiation and therefore make no allowance for hood delay or pilot's reaction.

T.O. No. 213

Martin-Baker Aircraft Co. Ltd:
Higher Denham Nr. Uxbridge.

Army Log Air In Alaska

Lieutenant Colonel Frank B. Case

IT APPEARS THAT we are long overdue in creating and exercising in peacetime and in maneuver our administrative-logistic airmobile distribution system," wrote Major General Richard D. Meyer in the April 1962, ARMY AVIATION DIGEST.

The conditions under which it operates have forced United States Army, Alaska, to develop an effective air logistic system for support of northern combat operations. USARAL's general concept of northern operations provides for the employment of independent task forces with full cross-country mobility in undeveloped wilderness areas. To enable independent forces to control large areas and concentrate against the enemy quickly, powerful task elements must be completely airmobile with Army aircraft. The effectiveness of the concept of independent task forces, moving and fighting across country on the ground and in the air, depends upon a responsive logistic support system. Air operations are a primary element of the system which USARAL has developed.

With three aviation companies to support its two reinforced battle groups, USARAL has a higher ratio of aircraft for assigned forces than any other Active Army command. During Exercise GREAT BEAR, a two battle group, 10-day maneuver in February 1962, USARAL aviation companies flew 680 missions involving 2,258 sorties and 2,155 flying hours. During these missions 5,288 passengers were airlifted, chiefly in tactical troop movements, and 422.8 short tons of supplies were hauled. One of the task forces averaged 20 tons of air-delivered supplies a day for the entire exercise period. At times it received its entire support by Army air for several days in succession.

Supply deliveries, of course, consisted largely of POL, rations, and simulated ammunition. POL was delivered in drums, using barrel slings. The refueling of armored elements by helicopter was particularly noteworthy. Ammunition transport presented the umpires with the problem of ensuring that aircraft were not credited with delivery of more simulated rounds than they were able to lift in real ammunition!

Rations were delivered by air, both to forward dumps and to units. The economy of overall effort which Army Aviation can effect is demonstrated by the use of helicopters to distribute daily ration and small arms resupply to rifle companies operating in wilderness areas. A 1-ton load of supplies is delivered on a skid pallet to the vicinity of the company, which recovers the supplies with the company light tracked vehicle. The daily resupply operation for the company is completed in a 20-minute flight from a general support installation; man and vehicle time and effort are saved along the entire tactical supply line. When helicopters are used in this way for forward unit resupply, duplicate caches are laid down slightly to the rear on the unit axis of advance to sustain operations on days when weather inhibits flight operations.

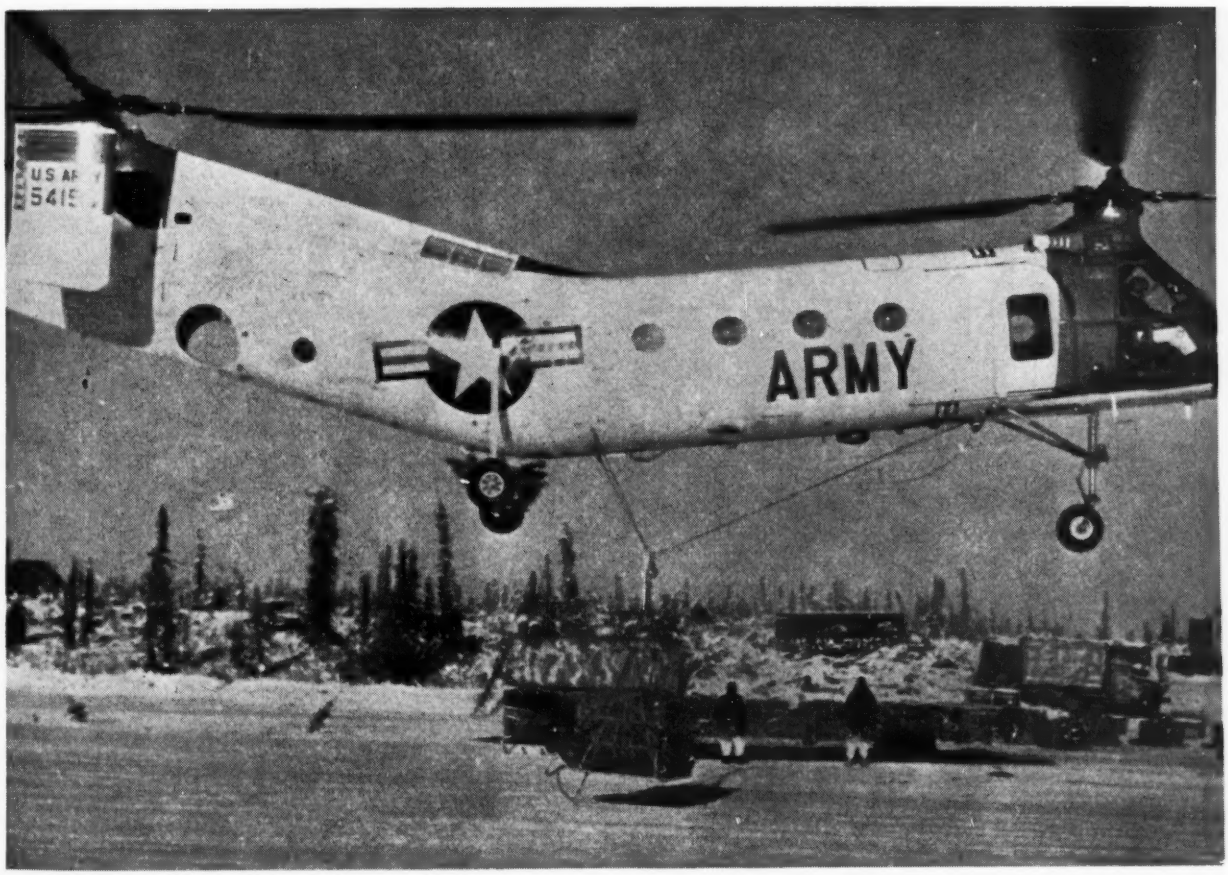
When infantry units walk away from their wheeled supply vehicles in cross-country operations, unit impedimenta is delivered to forward positions by air. Helicopters can be used to carry many other items of individual and unit equipment. By reducing the load on the individual, this increases his effective combat mobility.

Under northern operating conditions, support by conventional methods over the ground is often so costly in time and effort that Army air support is comparatively cheap and may be used advantageously for mundane tasks. CH-21 helicopters were employed in Exercise GREAT BEAR as Ordnance maintenance contact vehicles carrying maintenance teams, repair parts and, on occasion, replacement engines to the site of disabled vehicles. Equipment was put back into use within a matter of hours by this method. Without air-transported maintenance teams, much disabled equipment would have remained out of action for the

balance of the maneuver. In combat, this equipment would have become battlefield scrap before it was repaired.

When Army air support becomes a familiar instrument, commanders and staffs become alert to possibilities for its opportune use. For example, rolling liquid transporters are highly critical equipment in cross-country operations. Return of empty rolling liquid transporters to the rear by ground movement is slow. During GREAT BEAR, helicopters returning from forward area missions were used to haul empty RLTs from the front to rear POL filling points. This rapid return of empties increased the effective supply of RLTs in the combat area by 50 percent or better.

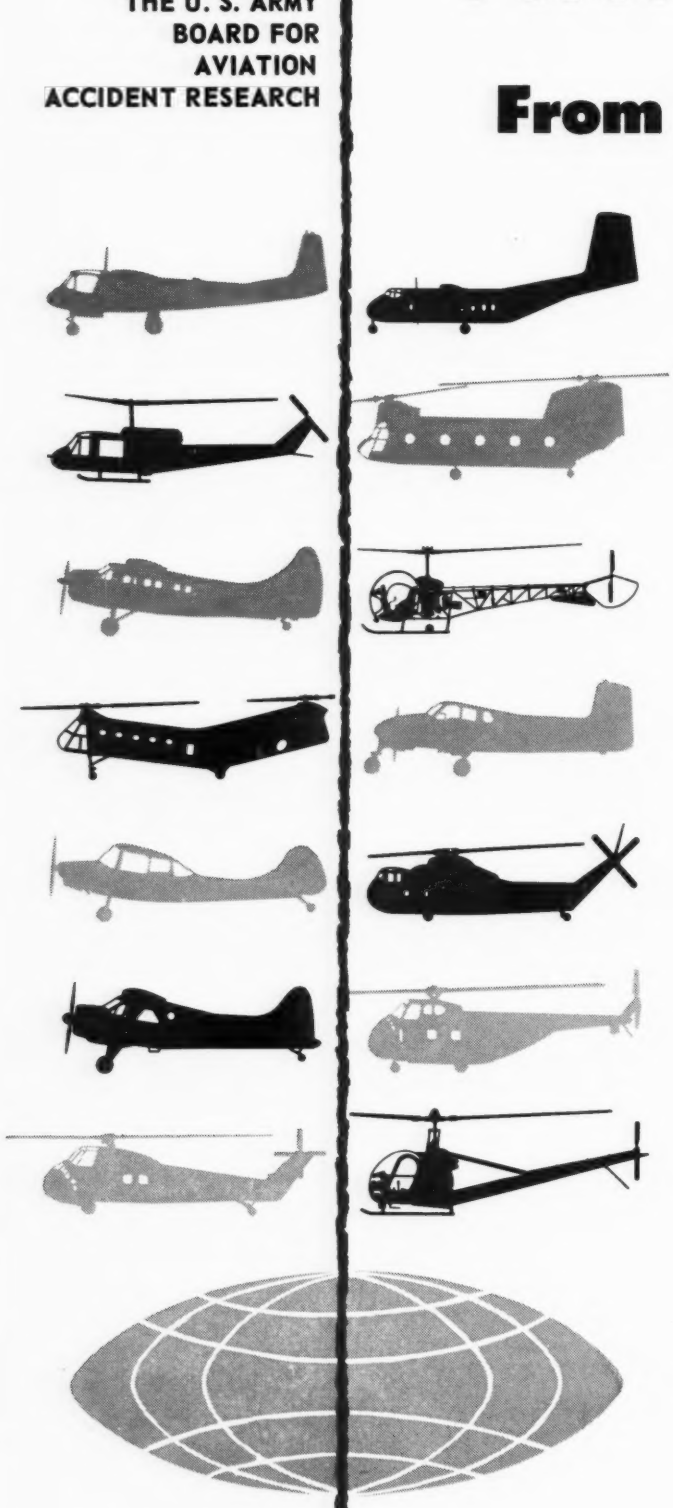
USARAL's air logistic operations today indicate the potentialities of an effective Army air supply distribution system. But airplane builders and airplane drivers alone cannot give the Army an optimum air capability. It is the operational commanders and staffs who determine the use of available air support and establish the requirements for additional support. Army Aviation and combat operations staffs at all levels must work together to implement General Meyer's conclusion: "Procedures and doctrine for our administrative-logistic airmobile distribution system should be developed as a matter of urgency."



prepared by
THE U. S. ARMY
BOARD FOR
AVIATION
ACCIDENT RESEARCH

TWX EXCERPTS

From Nov. and Dec.



U-8D LOST POWER from No. 1 engine while flying IFR at 8,000 feet. Emergency declared and forced landing accomplished with no damage. Analysis revealed one dead spark plug and 10 more which would not fire with pressure over 110 psi. All were lead fouled.

O-1A CRASHED INTO TREES and burned during crosswind takeoff from field strip. Instructor pilot and pilot sustained first and second degree burns to hands and face. Aircraft destroyed.

U-6A ENTERED DOWNDRAFT as paradrop bundle was pushed out of door. Parachute canopy snagged on tail wheel causing incident damage to turnbuckle assembly of tail wheel and tail cone.

U-1A ENGINE RAN ROUGH and emitted smoke during flight. Forced landing accomplished with no damage. Caused by exhaust valve failure in No. 3 cylinder.

OH-13E SETTLED WITH POWER while hovering over area of rocks and trees. Tail rotor struck rock and main rotor blade flexed into tail boom. Major damage to main rotor blades, tail boom, and tail rotor assembly.

OH-23C COOLING FAN gear box support failed in flight, causing disintegration of cooling fan blades and overheating of engine. Forced landing accomplished with no damage.

UH-1B LOST RPM and crashed into wooded area. Aircraft was flying echelon right on another UH-1B for approach to rooftop landing. During left turn to final, aircraft began to close on lead aircraft and was banked sharply to right to avoid collision. Rpm lost in turn. One passenger sustained serious head injuries. Pilot, crewchief, and six other passengers sustained lacerations, bruises, and sprains. One passenger also sustained fractured leg. Pilot and one passenger were hospitalized for observation.

CH-21 TACHOMETER FAILED at 700 feet during training flight. Pilot initiated autorotative procedures, thinking he had been given forced

landing. During resultant confusion, aircraft crashed in heavily wooded area. Instructor pilot and pilot sustained minor cuts and bruises. Extensive damage to all components. Investigation revealed no malfunction other than failure of engine tachometer.

CH-37B LANDING GEAR folded during landing on hard surface runway. Minor damage to forward bottom half of fuselage, loading ramp, clamshell doors, and landing light. Suspect malfunction of utility hydraulic system or electrical system.

CV-2 NOSE GEAR turned 80° during attempt to retract after takeoff for test flight. Attempts to straighten nose wheel by emergency steering system were unsuccessful and aircraft was landed on foamed runway. Incident damage to steering mechanism of nose gear. Two roll pins sheared.

RU-8D EMITTED SMOKE from No. 1 engine during flight. Engine was shut down and propeller feathered. Pilot was unable to maintain altitude and made wheels-up forced landing in open field. Major damage to engines, propellers, fuselage, right wing, and antenna. Cause undetermined pending investigation.

O-1A SETTLED ABRUPTLY during attempted wheel landing on road. Incident damage to propeller tips. Crosswind, gusting at 12 to 20 kt, considered a factor.

U-6A VEERED INTO FENCE during landing roll. Major damage to left wing. Weather not a factor.

OH-13E FLEW INTO UPDRAFT, then downdraft, in rapid succession while 30 to 40 feet above river near cliff. Pilot was unable to recover before right skid hit water. Aircraft landed level and sank in eight feet of water. Wind, gusting 15 to 25 kt, considered a factor.

OH-23D ENGINE OVERSPED to 4000 rpm during approach for landing. Forced landing accomplished with no damage. Caused by slipping clutch.

UH-1B TAIL ROTOR SEVERED FM radio antenna, which was installed backwards. Main rotor struck part of severed antenna. Aircraft landed from hover with no further damage. Incident damage to tail rotor blades and underside of one main rotor blade.

CH-21C LOST POWER during flight. Forced landing accomplished with no damage. Caused by failure of No. 7 cylinder.

O-1A STRUCK TREE during approach to tactical field strip. Major damage to wing and elevator. Weather was not a factor.

U-8F TAXIED OVER steel tie-down cable while parking on unlighted ramp at night. Cable was drawn into right propeller and thrown into right side of fuselage, causing incident damage.

UH-1B STRUCK BUSH during landing to investigate noise heard in cruise flight. Major damage to one main rotor blade. TWX did not explain source of noise.

CV-2B LEFT GEAR would not retract immediately following takeoff. Emergency landing gear extension initiated. Two touchdowns were made and gear locked in safe position. Aircraft landed with no damage.

UH-19D STRUCK TREE during takeoff from road strip. Incident damage to two main rotor tip caps.

U-6A ENGINE BACKFIRED and lost power at 3,000 feet. Engine continued to run with continuous backfiring. Forced landing in pasture resulted in major damage to landing gear, propeller, cowl, and engine. Suspect engine failure due to failure of cam drive for valves. Portion of cam gear drive system found in forward oil sump. No injuries.

OH-13G STRUCK TREE during low-level reconnaissance of road. Major damage to main rotor blade and aft cross tube. Weather not a factor.

OH-23D ENGINE COOLING fan transmission failed in flight. Forced landing accomplished with no damage.

UH-1B ENGINE FAILED in flight. Forced landing accomplished with no damage. Caused by crack in left side of fuel manifold.

U-8D NO. 2 ENGINE backfired and lost power during power reduction after takeoff. Engine continued to run rough at 1800 rpm or above. Engine was shut down and forced landing accomplished with no damage. Inspection of engine revealed carburetor intake screen missing and metal particles in oil screens.

U-6A ENGINE CUT OUT intermittently during IFR flight prior to entering clouds en route to on-top altitude. Aircraft returned to point of departure and landed with no damage. Suspect spark plug fouling.

OH-13H THROTTLE FROZE in flight, causing loss of rpm. Aircraft was autorotated. During pitch application for landing, engine surged and caused aircraft to pitch and turn. Main rotor blades struck ground and tail boom. Classification of damage undetermined.

OH-23D CLUTCH disengaged and immediately re-engaged during final approach for landing. Engine oversped to approximately 3700 rpm. Forced landing accomplished with no damage. Caused by failure of one-way clutch.

ARMY AVIATION MEDICINE

THE ARMY AVIATION STORY
PART VIII

Major Roland H. Shamburek and Colonel Spurgeon H. Neel

THE STORY OF Army Aviation Medicine might conceivably start during World War I when Maj Theodore C. Lyster, MC, USA, was appointed the first Chief Surgeon, Aviation Section, Signal Corps, United States Army. As such, his contributions in the fields of physical standards, pilot selection, physical examination, research, and specialized medical support for air units earned him the title of "Father of Aviation Medicine in America." Subsequent contributions of Army Aviation Medicine in the development of the U. S. Army Air Forces might also be reviewed. However, these do not offer a true chronological sequence to the establishment of the Army Aviation Medicine program.

Army Aviation Medicine cannot even claim the same birthday as Army Aviation, since the 6 June 1942 memorandum which made light aircraft organic to the Field Artillery did not incorporate special associated medical support. This support was provided by the Army Air Forces along with many other activities. Problems encountered by the Artillery's original flying groups at Fort Sill, Okla., were quite similar to those under investigation by flight surgeons in the Army Air Forces, and separate medical support and research would have invited duplication of effort.

In World War II Army liaison pilots in combat noted in many instances that true aviation medical support could not be maintained because of the lack of readily available Army Air Forces medical facilities. Nevertheless, the widely dispersed operations of Army liaison pilots made any consideration of specialized medical support unfeasible and premature.

Even the establishment of an autonomous United States Air Force in 1947 (and subsequently its own medical service) did not result in the birth of the Army Aviation Medicine program. Most qualified Army flight surgeons transferred to the Air Force, and under existing peacetime conditions Army Aviation depended almost completely upon experienced Air Force medical personnel for aviation medicine commitments. Actually, Army Aviation Medicine cannot point to a specific memorandum or date and claim a birthday. The program materialized as the need for it grew.

In 1950, Lt Col Rollie M. Harrison, a former Army Air Forces flight surgeon, was the only Army medical officer developing what could be considered an Army Aviation Medicine program. At Fort Sill, Okla., he was responsible for the medical care of aviation personnel and acted

---

Maj Shamburek is a Resident in Aviation Medicine, Fort Rucker, Ala.

Col Neel is Surgeon of the U.S. Army Aviation Center, Commander of the U.S. Army Hospital, and Senior Flight Surgeon of USAAVNS, Fort Rucker, Ala.

Lt Col Rollie M. Harrison

as advisor to the Director, Department of Air Training, in matters concerning aviation medicine.

The Korean War proved to be a major factor in initiating the current concept of close unit aviation medical support rather than in relying solely upon the Air Force's ancillary "area medical coverage" for Army Aviation. In Korea, Army Aviation units were located in forward areas with major tactical commands and were separated from Air Force facilities. Recognizing a need for its own direct medical support, the Army began sending selected medical officers through the Air Force basic aviation medicine course at the Air Force School of Aviation Medicine, Randolph AFB, Texas. Major Spurgeon H. Neel (now Colonel) was the first to complete this course, in March 1951. (Six others completed this 6-week course in 1952, but they left Army Aviation Medicine for other duties or left the service after their normal tour of duty.)

Colonel Neel used information gained during this course while serving as operations officer in the Eighth Army Surgeon's office in the Korean War, and later as commanding officer of the 30th Medical Group in Korea (June 1953 - November 1954). In these capacities he was instrumental in establishing Army aeromedical evacuation policies and organization, and, in March 1954, in developing the policies for using aviation medical officers within the Eighth Army.

Further recognition of the growing role of Army Aviation and its medical aspects was reflected on 17 October 1952 when the Army directed that the Surgeon General, along with the Army Assistant Chiefs of Staff for G-1, G-2, and G-3; the Chief of Army Field Forces; the Chief Signal Officer; the Chief of Transportation; and the Chief of Engineers establish within their offices an agency to supervise and coordinate all functions related to Army Aviation.

As such, Section II, the Surgeon General's office Order Number 62, dated 6 November 1952, established the Army Aviation Section as a component of the Hospitalization and Operations Branch of the Medical Plans and Operations Division within the Office of the Surgeon General. This section was given the responsibility for

- the overall supervision and coordination of functions of the Surgeon General relating to Army Aviation;
- furnishing technical advice to the Department of the Army on medical matters pertaining to Army Aviation;
- evaluating aircraft ambulance unit requirements for current and planned operations and making recommendations on total numbers of units to be used in mobilization planning.

Major Leonard A. Crosby (now Lieutenant Colonel) of the Medical Service Corps, was the first chief of the Army Aviation Section. (On 1 December 1954 Colonel Neel became the first Army Aviation Medical Corps officer to head the section.)

On 12 November 1952, AR 40-110 established standards to be used by medical officers performing aviation physical examinations. The regulation differed very little from the standard AF examination, but it did make this information available in a specific regulation on an Army-wide and officially recognized basis.

However, the majority of flying examinations, other than at Fort Sill, continued to be performed by Air Force flight surgeons. This was mainly due to the small number of Army Aviation medical examiners trained after the initial group. Only two Army medical officers were graduated from the formal Air Force course in aviation medicine between December 1952 and October 1954. Quotas for the 11-week course of training had been available throughout this period, but Army medical officers were reluctant to volunteer for the aviation medicine program. They knew little about it or its career potentials.

To partially offset this, the Army Medical Field Service School at Fort Sam Houston, Texas, added 46 hours of instruction in aviation medicine for career Army Medical Corps officers attending the primary course in military medicine. Also, 17 graduates of the advanced course in military medicine in 1953 were given a short course of instruction (46 hours) at the Air Force school at Randolph AFB, and then two weeks of practical orientation in Army Aviation Medicine at the Army Aviation School, Fort Sill, Okla. There were mixed sentiments on the adequacy of this training, including a letter from this class recommending a longer period of training. However, it was necessary to continue this pro-

gram as an interim measure until further volunteers could complete the formal 11-week Air Force course.

Early 1954 marked the first formal recognition within the Army of a distinct aviation medicine military occupation specialty. MOS 3160, Aviation Medical Officer (AMO), was established for officers who were to "provide aviation and general medical service for Army Aviators and associated ground personnel in hospitals, dispensaries, field units and other military installations." To qualify for this MOS, Army medical officers were required to be graduates of a recognized course in aviation medicine and capable of performing the required duties of an AMO. The title of Aviation Medical Examiner was eleminated. It had been misleading, and it was frequently misinterpreted to an extent that Army Aviation medical examiners often found themselves with a primary and sole duty of performing all physical examinations for a particular installation. The new title did not assure AMOs that they would not be responsible for all physical examinations, but it did offer some basis for involvement in other important phases of an active aviation medicine practice. The new MOS made no mention of flight requirements or incentive or hazardous duty pay.

A meeting in the Surgeon General's office on 2 April 1954 on the subject of the present and future position of Army Aviation Medicine resulted in the following recommendations:

- continued use of Air Force and Navy flight surgeons as consultants when appropriate;
- greater use of the formal USAF course in aviation medicine to train Army medical officers rather than the interim 46-hour short course in operation;
- consideration of flying pay as an incentive to interest additional medical officers in aviation medicine;
- aviation medicine should be considered as part of field medicine.

No definite decision was reached on these subjects. However, the Medical Plans and Operations Division was instructed to study these areas on a continuing basis and implement improvements when feasible.

The Army's projected requirements in late 1953 included 17 aviation medical officers as of 1 January 1954; 30-35 by the end of fiscal year 1954; and 60-70 by the end of fiscal year 1955. These requirements were based on projected Army Aviation growth and accepted aviation medical officer authorization policy. The latter stated that any installation or unit with over 30 pilots should be authorized at least one aviation medical officer. This meant that an AMO would be assigned to each Division, Corps, Field Army, Transportation Helicopter Battalion, and at major commands and schools—such as the Army Aviation School.

This recognition of Army Aviation Medicine undoubtedly contributed to an increase in medical officer applicants for the formal aviation medical course at Randolph AFB. From October 1954 to December 1955, 24 Army medical officers were graduated from this school and the orientation course at Fort Sill.

In late 1954, major medical commanders were requested by the Surgeon General's office to study the problem of assignment and use of aviation medical officers and to submit specific recommendations by July 1955. Based on these recommendations, basic TOEs and TDs were subsequently changed to incorporate aviation medical officers. The final recommended plan of utilization remained essentially unchanged from previously suggested authorizations. In many cases, the aviation medical officer was not an added authorization but only substituted for a "Medical Officer, General Duty" (MOS 3100), involving both general and aviation medicine duties.

Army Aviation Medicine at Fort Sill continued to be represented by Colonel Harrison. When the Army Aviation School was formally established at Fort Sill on 1 January 1953, a medical section was incorporated as a school staff position. As such, the senior medical officer acted as technical consultant to the director of the Department of Air Training on aviation medicine in addition to operating the flight dispensary, conducting medical training, and maintaining the necessary medical records. Colonel Harrison remained in this capacity until he was transferred to Germany in 1955.

The movement of the Aviation School from Fort Sill to Camp Rucker in 1954 was not without its share of medical problems. In 1955 Colonel William H. Byrne succeeded Colonel Harrison at the School as Staff Aviation Medical Officer. While Camp Rucker was being organized as the Aviation School, long hours and the lack of adequate facilities [which were under construction] rapidly created a problem of physical and mental fatigue among instructors. Recognizing this problem, Colonel Byrne became actively involved in attempting to regulate maximum individual flying hours and in making numerous other recommendations related to aviation safety.

Col William H. Byrne

Attrition due to previously undetected physical defects continued to be a major problem at the Aviation School in 1955. However, little could be accomplished until a sufficient number of trained AMOs were available throughout military installations to adequately perform initial examinations on applicants. The Surgeon General's office acted to meet the problem by reviewing all disqualified examinations to determine the major discrepancies and inadequacies causing this attrition and to initiate corrective action at the installation performing entrance examinations.

Following the move to Camp Rucker, certain areas of concern to the medical section took on an air of humor, as shown in Colonel Byrne's letter of 25 April 1955 to the Commanding General, Army Aviation Center. Colonel Byrne's only officer (an MSC pilot) was required by post regulations to serve from sunrise to sunset as standby pilot for an emergency-equipped H-13 rescue helicopter. This was in addition to his primary duties as Colonel Byrne's administrative assistant, the medical detachment commander, motor officer (11 ambulances), training officer, Class A finance officer, and assistant adjutant general. Obviously, Colonel Byrne felt one officer was unable to accomplish all of these duties and rather logically requested a revision to the regulation and additional medical personnel.

About the same time a letter of reply from Colonel Byrne's office relative to the acquisition of books by the school library reflected a rather humorous situation: "Concur but please do not stock any medical text other than medical history . . . certain people memorize symptoms of certain disorders and present them in a very convincing manner."

In 1955 several other significant happenings occurred in aviation medicine. On 2 March, TB MED 244, "Army Aviation Medicine," was published and was one of the first truly Army Aviation oriented medical publications. It described the duties and functions of an aviation medical officer and presented detailed procedures for accomplishing the flight physical examination. In addition, it gave a brief but concise resumé of the physiological, psychological and administrative information required to conduct an effective "care of the flier" program. This TB MED is still in effect with only minor change.

In August 1955, the Surgeon General recommended that

- participation in frequent and regular aerial flights be considered necessary to the effective practice of aviation medicine;
- Army Aviation medical officers, actively engaged in the practice of aviation medicine, hence required to participate in frequent and regular aerial flights, shall be considered eligible for non-crewmember flying status.

These recommendations were approved in September 1955 by the Army Assistant Chief of Staff, G-1. At that time there were 28 qualified AMOs who were authorized non-crewmember flying status with its accompanying hazardous duty pay.

Also in 1955, the Surgeon General initiated action to secure authorization for a distinctive insignia to be worn by qualified aviation medical officers. From custom and long experience, flying personnel had come to expect their physicians to wear wings. In addition to facilitating the practice of aviation medicine, it was felt this would serve as an additional incentive for career medical officers to enter the program. Such authorization was secured in the summer of 1956.

In spite of the apparently increased awareness of the medical problems accompanying the growing Army Aviation program, proper utilization of assigned AMOs frequently was overlooked. Upon reporting to their first assignment, many AMOs were greeted with statements such as, "I thought we let the Air Force handle those problems" or, "We've been looking for a fulltime specialist in physical examinations." Consequently, an informational brochure, "Medical Aspects of Army Aviation," dated 1 October 1955, was distributed to the field to assist in a better understanding of the Medical Service's role in Army Aviation. In addition, a Department of the Army letter, dated 7 June 1956, was published to assist in the assignment and utilization of AMOs by local commanders.

Further expansion of the Army's aviation medical training program occurred in July 1956 when the U. S. Naval School of Aviation Medicine, Pensacola,

Fla., began accepting Army medical officers for its 22-week course. This did not replace Army participation in the Air Force course at Randolph. Rather, it provided an expanded training program for Army medical officers. The last six weeks of the Navy course involved an extensive flying program, including soloing the T-34 aircraft by most students.

Lieutenant Colonel Richard B. Austin, III, and Capt Henry B. Tyminski were the first Army graduates (on 14 December 1956) from the Naval School of Aviation Medicine. Approximately 7-8 medical officers per year completed this course over the next 5 years. In addition, about 118 medical officers completed the Air Force Primary Course at Randolph AFB from 1956-1961. Army graduates of both schools continued to attend the Army Aviation Medical Officers Orientation Course at the Army Aviation School immediately after completion of their respective training with the Navy or Air Force.

The year 1956 was significant in other respects for Army Aviation Medicine. The 19 April 1956 order which directed the Army to assume responsibility for all Army Aviation training also increased the Army's responsibility for its own aviation medical support.

In August 1956 the Army Aviation medicine program received added stature when the Army Aviation Section in the Surgeon General's office was elevated to branch status. Lieutenant Colonel Spurgeon H. Neel had served in this position since 1 December 1954 and was responsible for monitoring and supervising overall aviation medicine and aeromedical evacuation activities within the Office of the Surgeon General. He remained chief of the Aviation Branch until September 1957 when he became the first Army medical officer to enter the formal United States Air Force advanced program in aviation medicine, leading to certification as a specialist in that field.

Army participation in the Aviation Safety Course at the University of Southern California began in October 1956 and proved mutually beneficial to Army Aviation and Army Aviation Medicine. Graduates of this course (non-Medical Corps personnel), having been extensively exposed to aviation physiology and psychology during their 10-week course of instruction, were better able to understand and work with unit flight surgeons concerning the medical aspects of accident investigations. Such team work emphasized the importance of considering physiological and psychological factors in aircraft accident investigations.

Twenty-five additional aviation medical officers were graduated from the Air Force Aviation Medicine School and seven from the Navy's school in 1957. This still fell short of the Army's requirement for approximately 67 AMOs; however, the addition of about 30-35 new AMOs yearly provided aviation medical support to various commands until a total of 117 AMOs was reached in February 1962.

In October 1958, the first Army Aviation medical officers completed the Crash Injury Investigation Course sponsored by Aviation Crash Injury Research of Cornell University (presently a division of the Flight Safety Foundation). This 2-week course, held in Phoenix, Ariz., was designed to train key military and civilian personnel (medical and nonmedical) in crash injury investigation, reporting, and analysis. Since the first class, about 80 AMOs have completed this training.

In June 1960 the first Army Aeromedical Symposium, sponsored by USABAAR, was hosted by the Naval School of Aviation Medicine in Pensacola, Fla. The symposium was attended by many senior Army medical officers, aviation medical officers, and related personnel in Army Aviation. Outstanding authorities, both military and civilian, presented a program oriented toward Army Aviation Medicine, particularly those aspects related to aviation safety. This was the first time a sizeable group of Army Aviation medical officers met and discussed common problems involved in the practice of aviation medicine. The meeting also provided the opportunity to present the role of aviation medicine to the senior medical officers in attendance and, thereby, increase their understanding of the role of Army Aviation Medicine.

Lieutenant Colonel Spurgeon H. Neel completed his formal residency training in aviation medicine at the Air Force School of Aerospace Medicine in 1960 and was certified by the American Board of Preventive Medi-

Col Spurgeon H. Neel

cine in the specialty of aviation medicine. As such, Colonel Neel became the first board certified flight surgeon in Army history. He was assigned to Fort Rucker after this training and subsequently became hospital commander and flight surgeon for the Aviation Center, the position he now occupies. Since 1960 two to three Army flight surgeons per year have entered the Air Force residency program.

One of the most notable developments in Army Aviation Medicine was the formal recognition on 1 July 1960 of Fort Rucker as a third year (Phase III) training site for the Air Force Aviation Medicine Residency Training Program. Use of Fort Rucker provided Phase III residents a training site in an Army Aviation environment and was also beneficial to the Aviation School and Center, which is well able to use these experienced flight surgeons. As of September 1962, eight individuals were in residency training:

Major Harold R. Chappell, Maj Roland H. Shamburek and Capt James E. Hertzog in the third year of training (Phase III), which is conducted at Fort Rucker.

Major Quitman W. Jones and Maj Kelly C. Gregory in the second year of training (Phase II), held at the USAF School of Aerospace Medicine, Brooks AFB, Texas.

Captain William H. Hark, Capt Delvin E. Littell and Capt Dominic J. Rosato in their first year (Phase I), at the Harvard School of Public Health, Boston, Mass.

Another notable medical contribution to Army Aviation was the establishment of the Army Aeromedical Research Unit at Fort Rucker on 6 July 1962 under the command of Lt Col John D. Lawson. This unit, conceived by Colonel Neel, has the mission to define, investigate, and recommend solutions to aeromedical problems encountered in Army Aviation. It also serves as a central source of reference material for the Army in aviation medicine. Maximum use will be made of available knowledge, coordinated efforts with other military and civilian research activities, and further related research to answer the needs of Army Aviation.

In other areas Army Aviation medical officers have been assisting in the National Aeronautics and Space Administration's Project Mercury. Notable among these are Capt (now Maj) William S. Augerson who recently completed a 3-year assignment with NASA personnel at Langley AFB, Va., working on capsule design and in the training of the astronauts. Other AMOs who played important roles in Project Mercury are Lt Col John A. Sheedy, Lt Col John D. Lawson, and Capt Richard A. Pollard.

Army Aviation Medicine also was represented with the Federal Aviation Agency for about 3 years by Maj Wayne R. Otto (now Lt Col) while he was a staff medical officer, Office of the Civil Air Surgeon, FAA. Colonel Otto is presently chief of the Aviation Branch in the Surgeon General's office.

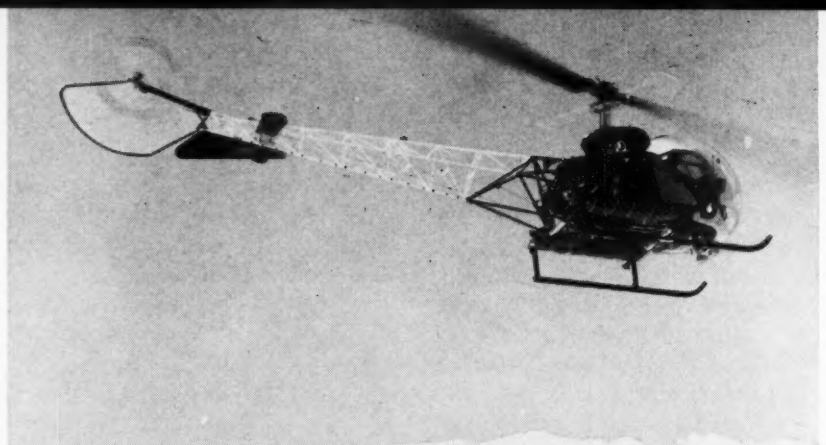
Lt Col Wayne R. Otto

In addition, Aviation medical officers have represented the Army in offices or on committees of USABAAR, the NATO Advisory Group for Aeronautical Research and Development, the Joint Committee on Aviation Pathology, the Aviation Crash Injury Research activity, Aerospace Medical Association, and many others.

On 1 July 1962 Aviation medical officers with a military occupational specialty (MOS) of C3160 (flight surgeon) or B3160 (senior flight surgeon) were authorized crewmember flying status. This designation gave Army flight surgeons status comparable to that of Navy and Air Force flight surgeons. As of 1 September 1962 there were 37 medical officers with this MOS, plus 60 with MOS D3160 (aviation medical officer).

The future of the Army Aviation Medicine program will certainly parallel the overall Army Aviation program. Medical problems will be met by prior planning rather than corrective action, and such planning is now in being by a fast growing, dedicated group of aviation medical officers.

Army Aviation Medicine will continue as a special field—largely preventive medicine—concerned with integrating, applying and extending fundamentals of clinical, basic medical and allied sciences to biological problems associated with flight. The mission will remain to promote safe and efficient flight operations, maintain the health and longevity of the flying personnel, and contribute to and support the overall mission of Army Aviation.



Author believes a formal helicopter mountain flying school would aid materially in reducing accidents and fatalities in

Helicopter Mountain Flying

Captain Harold T. Campbell

YOU FINALLY have your peak picked out and a suitable landing area spotted near the crest, just back from a sheer drop of 3,000 feet. You have nailed down your wind by the smoke in the valley and have turned in on a long, cautious final approach at a 30° angle of descent. While tooling in you remember that your helicopter is loaded only to half capacity and at the same time glance down at an altimeter that reads 5,340 feet. No sweat! Power to burn!

As you come nearer to your touchdown point you start adding a touch of power and pitch. As you come even closer you notice that you have quite a bit of pitch and power in and don't seem to be getting that into-the-wind lift that should be there. Then you find yourself, with aircraft in hand, over the touchdown point. The aircraft refuses to respond to a rapid application of pitch and power and the tail begins to turn to the left! Within the next second your machine touches down at a bad angle! All power gone! You're fighting to get the "bird" over that cliff side! You ricochet on one gear! You overpitch! She surges forward and just clears the precipice. You fall like a rock and notice that you've badly overpitched by 400 rpm. You get it all back in shape again, land, light up and pull some smoke through that micronic filter. Boy, did you goof!

Sound familiar? Sure it does! If you've ever flown in hill country or mountains, then you've had a similar experience.

Not only did our pilot not know how to determine his wind at altitude, he never checked by making "dummy approaches" to see how the upflowing air from the sheer cliff was affecting his selected point of touchdown. He also made the cardinal mistake of counting on his power reserve to "bull" his way out of trouble. As you move up in altitude, it's obvious that your engine and aircraft efficiency must be reduced.

To get to the point, this writer had the distinct pleasure and privilege of attending a mountain helicopter training course conducted by Okanagan Helicopters, Ltd., of Vancouver, B. C., Canada.

Attendance at this course did not by any means make us experts in the ticklish art of mountain flying. It did, however, teach us many techniques that were unknown before and has given us a little more experience upon which to rely in the per-

---

Capt Campbell is assigned to the Aviation Support Equipment Branch of the U. S. Army Transportation Board at Fort Eustis, Va.

formance of a given mission.

For example, one technique is the simple procedure of determining what your wind conditions will be on a proposed mountain landing site. For simplicity's sake a conical peak is selected to land on. You approach the peak at crest level and establish a circular pattern around it at an indicated airspeed of 40 knots at a constant altitude. As you course your way around it several times, you notice that you run into an area where your relative groundspeed rapidly increases, followed by a slight overall vibration in the aircraft and a high power and pitch setting to maintain that crest level altitude. As you ride out of the vibration area, your relative groundspeed slows, and you reduce power and pitch to maintain the same altitude.

You then realize that you want to do all of your flying and approaches on the side where you have slow relative groundspeed, low power settings, and no vibrations. This will put you in the best air and more directly into the wind. You will then make all approaches just outside the turbulence area and angling into the wind. A flight path along this approach line will never allow you to make an approach directly into the wind, therefore keeping you out of turbulence and downflowing air. Simple! (See fig. 1 and 2.)

In the past it has been a practice by tyro mountain pilots to select an approach path to a proposed landing site as directly into the wind as possible. This procedure requires the pilot to fly through the area of downflowing air and turbulence, with a resultant application of excessive power and pitch. Once passing through this "poor air" area he finds himself back in "good uplifting air" which requires a quick reduction of power and pitch at the last moment—a situation that is most undesirable in mountain flying.

Numerous accidents have resulted when pilots approaching into the downflow side of a ridge have crashed into the hillside because the downflowing air was too strong for the aircraft to overcome.

Accidents of this category have cost lives, valuable aircraft, and money.

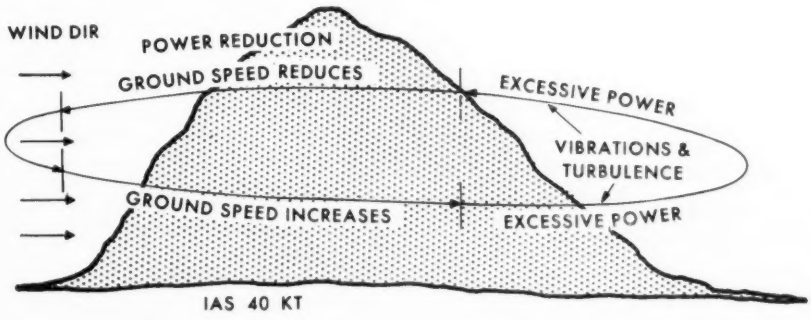
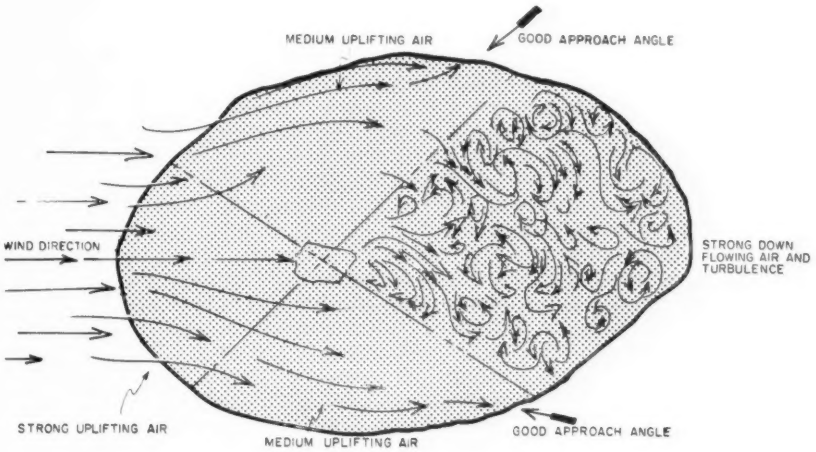


Figure 1. Wind determination

Figure 2. Top: profile view of peak. Bottom: plan view.



Many other facets of mountain flying were covered during the 35-hour course. Included was instruction in operations in mountain river gorges with perpendicular sides rising to heights of 300 feet on either side. Due to the extreme sidewall heights and the narrow widths of the gorges, it was necessary to work well below the ridgeline and execute pedal turns while working these sites. Training also included approaches and takeoffs to man-made wooden platforms built on sheer cliff sides and on top of mountain pinnacles.

Within the time frame of an allotted 30-day period and a 35-hour flying program, all phases of mountain flying were covered. All flight training was conducted in a Bell 47G-2 (OH-13H) and all initial takeoffs were at maximum gross weight, making all altitude operations extremely marginal.

To date, the Army has no formal training program that includes flight training in mountain helicopter flying. Of course, some commanders at local levels have instituted their own unit programs. Without a doubt this type training is better than no training at all, but the interpretation of procedures in different units vary widely and this creates nonstandard techniques throughout the Army.

A solution to this problem would be to establish a U. S. Army Helicopter Mountain Flying School at some established military base in the Rocky Mountains. The school should be a branch of the U. S. Army Aviation School at Fort Rucker, Ala., to ensure complete control of a standardized course of instruction. The area selected for training should allow for a progressive working of landing sites at a relatively low altitude up to a selected peak altitude. Student selection should be on a priority basis, with preference being given to pilots with assignments requiring hill and mountain flying.

In considering the vast, wide-flung number of aviation assignments possible throughout the world, it is readily apparent that a special course in mountain helicopter flying is needed. A course of this type could result in the saving of many needlessly lost lives and aircraft, and tremendous savings in monetary resources.

★ ★ ★

The percentage of rotary wing aviators required to be fully qualified in mountain flying techniques upon graduation from USAAVNS is insufficient to warrant inclusion of such intensive training in the POIs for all R/W aviators. Basic theory and pinnacle (platform) flight training effectively grounds all students in the fundamentals of these techniques. It is more economical and practical to fully qualify aviators at unit level when (and if) the requirement exists. Unit IPs, intimately familiar with the principles of the local mountainous area can, and do, conduct excellent courses to fully qualify newly assigned aviators. This system not only gives advanced training in mountain flying techniques, but fully acquaints the new aviator with the peculiarities of the local area.
—Editor.

Rotary Wing Accidents
in Mountain Operations
1 Jan 59 — 30 Oct 62

Accidents:	48
Cost:	$4,778,565
Fatalities	11

Available Now Through Your Film and Equipment Exchanges

Title	Nr	Time-Min
The Eye in the Sky (SD-1 Drone)	MF 20-9401	16
Basic Cross-Country Helicopter Flights	TF 46-3171	19
Automatic Direction Finder	TF 46-3200	30
VHF Omnidirectional Range (VOR) Part I—Principles of Operation	TF 46-3179	21
Flight Line Safety	TF 46-3105	20
Cross-Wind Techniques—Fixed Wing	TF 46-2821	25
Stabilizer Bar	TF 46-2673	11
Primary Helicopter Training—Night Operations	TF 46-3218	16
AGREE In Action (Reliability Engineering)	MF 11-9735	43

Tired and Listless? CRASH SENSE

PREPARED BY THE UNITED STATES ARMY BOARD FOR AVIATION ACCIDENT RESEARCH

TIRED BLOOD

MOST OF US HAVE suffered through TV commercials that go something like this—

"Do YOU feel tired and listless? Is every day a constant uphill struggle?

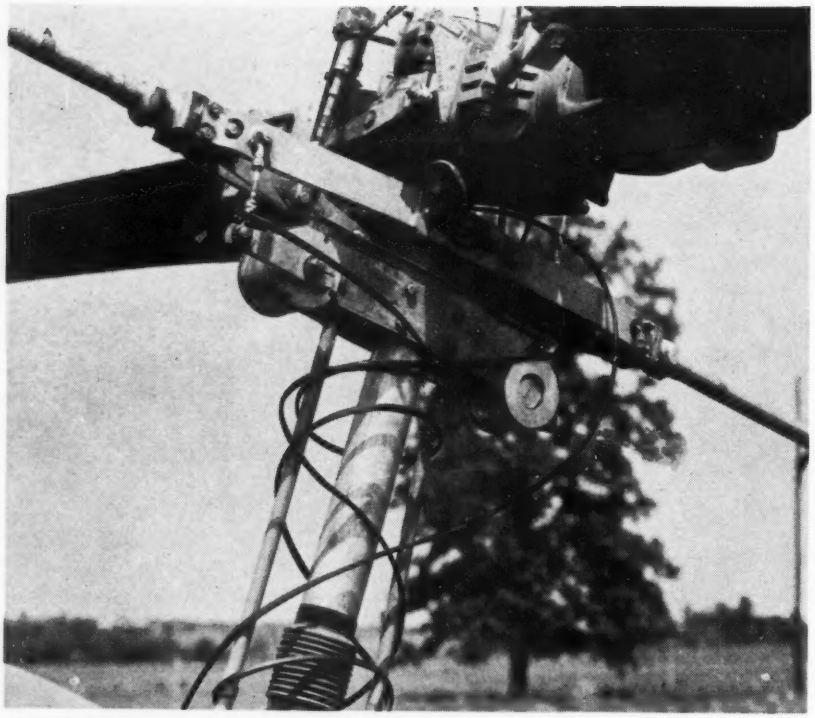
"Friends, YOU may be suffering from pernicious anemia—tired blood. If so, what YOU need is VARICOSE tonic. VARICOSE tonic comes in either liquid or capsule form, and it's guaranteed to make you feel better in just ten short days, or your money will be cheerfully refunded. Get some TODAY!"

After a hard day in the cockpit, a pilot hearing this might be tempted to rush out and stock up some of this marvelous product. Unfortunately, despite its alcohol content, varicose tonic holds little promise for the type of fatigue he feels. What he needs is a good hot meal and some rest. If he gets these, chances are he'll be bright eyed and bushy tailed for tomorrow's flying. If he doesn't . . .

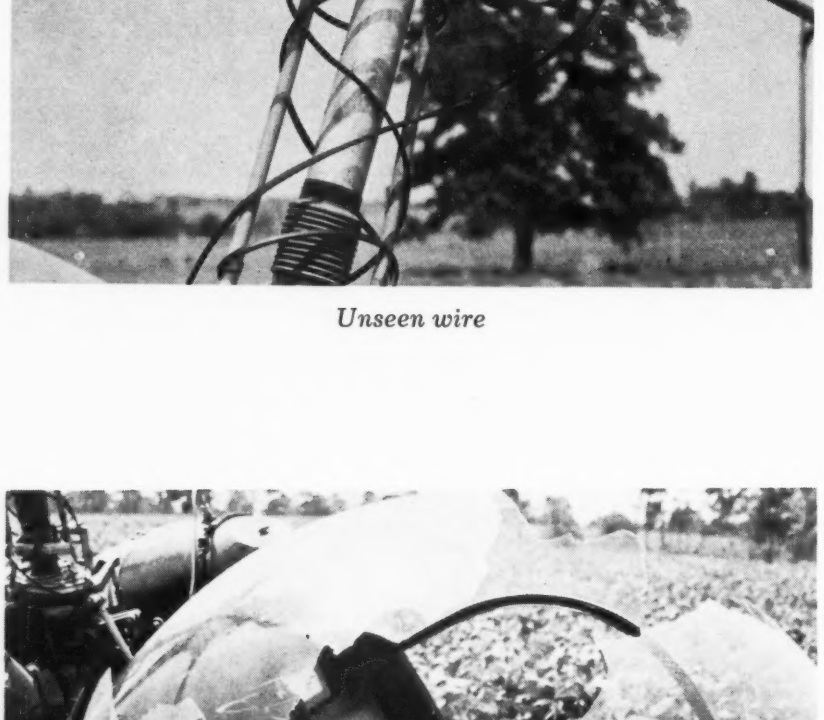
WIRE STRIKE

". . . I selected an open field containing bean plants as a landing site.

". . . After reconnoitering the landing site, I set up an approach and made a normal descent until



Unseen wire



Traps fatigued pilot

striking the wire. I did not see the wire until contact was made with the top of the bubble."

Though partial control was maintained, the Sioux crashed into the bean field and was destroyed. The pilot and his passenger escaped injury.

Had this aviator ever been noticeably careless in carrying out his flying responsibilities? Far from it, according to his superiors.

"I have flown with him many times before," the passenger said, "and I consider him to be the best pilot I've ever had."

"He mentioned wires as hazards to me many times and was extremely careful when descending or climbing," remarked a witness to the crash.

While the accident report made it clear that a more thorough reconnaissance should have been made, it also stated: "*The pilot experienced extreme fatigue due to lack of sleep and the heavy flying commitments imposed on him.*"

How much sleep? Four hours in the 24-hour period preceding the crash.

How much flying? The pilot, *who was beginning his tenth hour of flight for the day at the time of the accident*, had flown 29 hours and 30 minutes during the previous week.

Diet? Cold rations for the 48-hour period before the crash.

Short of actually falling asleep at the controls, how does fatigue affect an aviator? A fatigued pilot has a hard time dividing his attention wisely. He's likely to concentrate on a particular aspect to the exclusion of other equally demanding factors. He loses initiative and disregards checks he would normally make. His responses are poor, and he may think he's doing his best when his performance is actually far below average.

When a machine runs out of fuel it stops, and no amount of coaxing will get it to run again without more fuel. That's why we have fuel gauges. It's why a great deal of thought and planning are given to assure adequate fuel supplies for any military maneuver. As evidenced by this accident, humans are sometimes called on to sputter along in a critical and demanding role long after their fuel supplies of physical and mental stamina have reached the danger point. While a satisfactory aviator stamina gauge has yet to be invented, we do have flight surgeons, and we have a guide for flying time limitations in DA Circular 95-4. Both can be used effectively with some thought and planning.

MORE ABOUT THE CARIBOU

CRASH SENSE brought you the rumor-squelching story of two Caribou wing failures in the November 1962 issue. Now, from Maj Joseph A. Gappa, Jr., Chief, Engineering Section, USABAAR, comes an analysis of the overstress forces that caused the wings to fail plus some sound conclusions.

The first accident happened during a demonstration landing in which the rate of descent was calculated at 19 feet per second and partial brakes were applied prior to touchdown. The second happened when the aircraft hit turbulence and a downdraft on short final for a crosswind approach. Its right wheels struck a dirt mound at the end of the strip and the right wing was sheared at the root. Landing weights were computed at 24,461 pounds for the first aircraft and 27,915 pounds for the second.

Though the circumstances of these two accidents were completely different, the physical forces producing wing failure in each case were nearly the same.

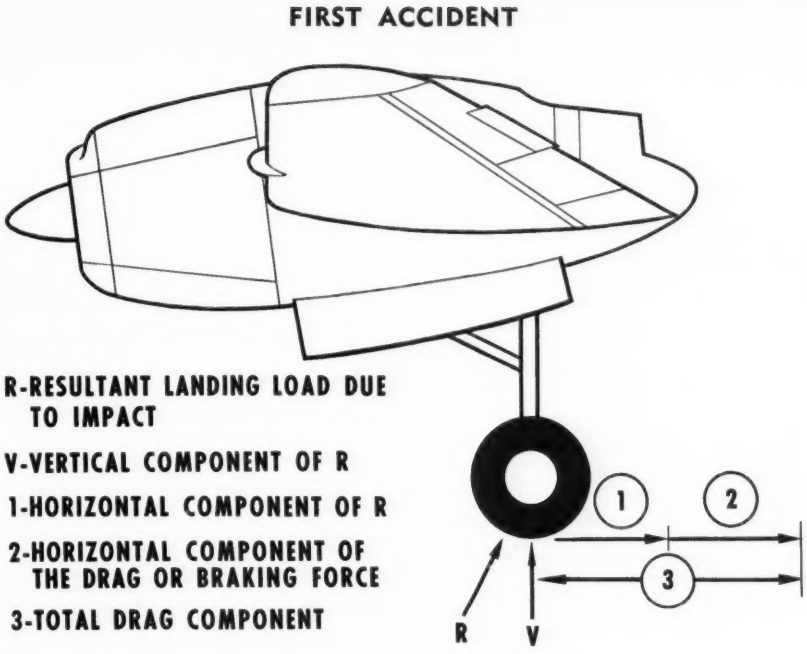


Figure 1

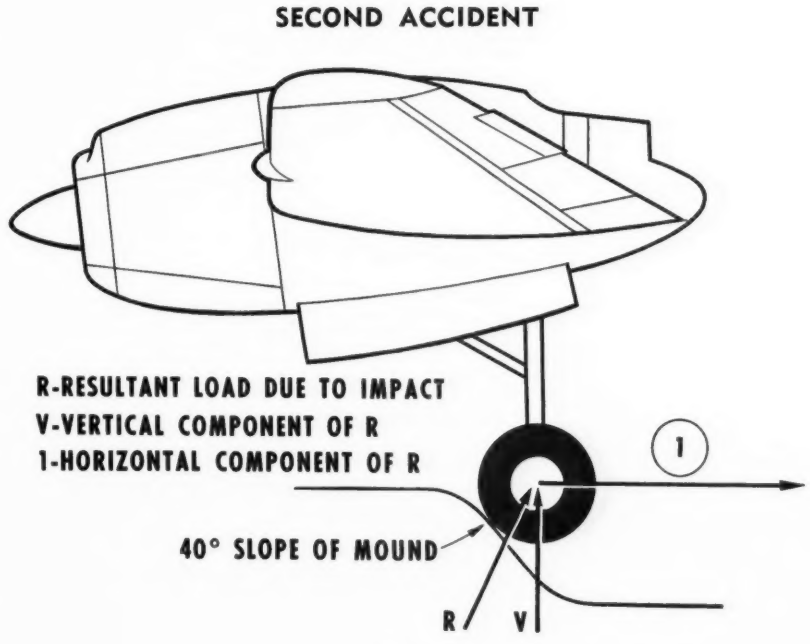


Figure 2

Forces acting on the structures of both aircraft can be resolved into horizontal and vertical components acting *simultaneously* through the landing gear. These forces were essentially the same for both accidents. Their magnitude is important only to the extent that it was in excess of designed ultimate strength and induced wing failures.

The Caribou wing is a single

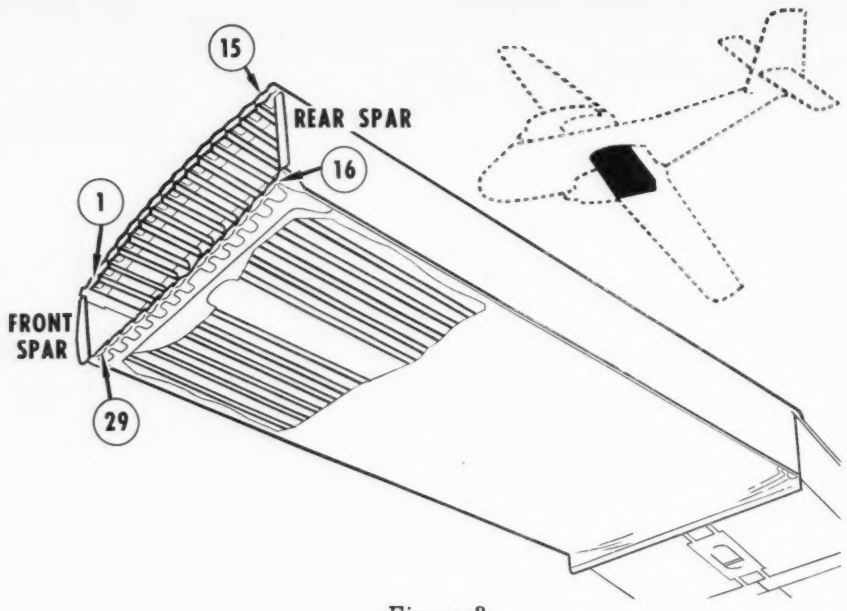


Figure 3

cell, torsion box structure as illustrated in figure 3. This piece in the inboard section where failure occurred has 29 stringers. The designed strength of the torsion box in each wing was destroyed when rivets holding the skin together sheared. This happened in the rear spar of each wing from approximately ribs 3-8, or from the plane of the fuselage into the engine nacelle region.

This cross-section view of the engine, landing gear, and wing shows forces considered to be acting at the instant of touchdown. Note that the horizontal and vertical forces, plus the center of mass of the engine are shown. The shear center of the torsion box is the point through which resultant shear forces must act to cause wing deflection. However, in producing this deflection, the resultant force will cause no rotation about an axis perpendicular to the wing cross-section.

With these preliminaries understood, each force can be examined singly to determine its effect on the torsion box. The summation of these forces will produce the total effect.

The force in figure 4 will produce shear flows of varying intensities between the 29 stringers of the torsion box skin. Shear flow (q, in #/in), the product of shear stress (f_s, in #/in^2) and skin thickness (t, in inches), is a more meaningful way of examining stress produced in wing skin (or $q = f_s \times t$).

Shear flows due to force 1, or the normal force, are represented in figure 5 by the vertical arrowheads. In addition, due to this same force acting at a distance (d) from the shear center of the torsion box, a torsional force will produce shear flows as represented by the arrowheads in figure 6.

Figure 5

The situation represented in figure 6 is drastically aggravated when a drag (braking) force is applied simultaneously.

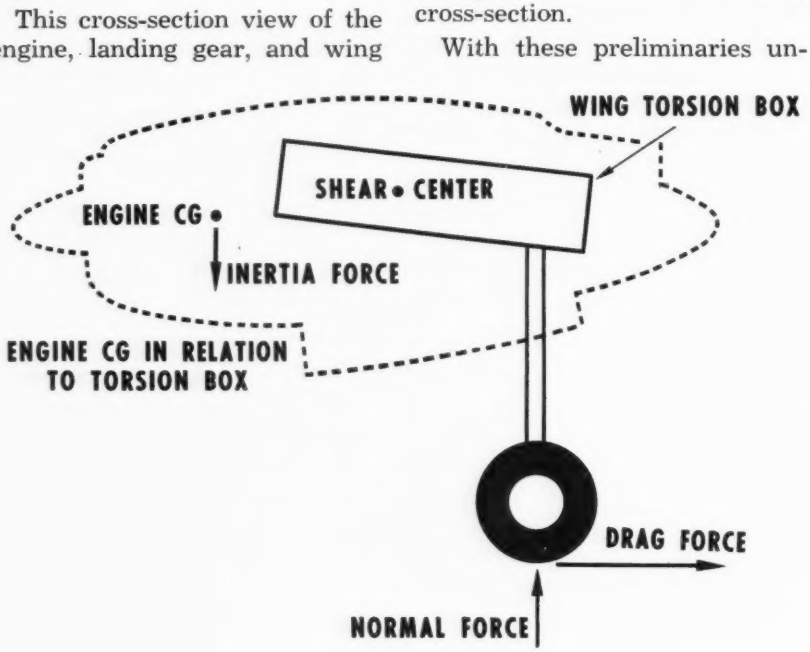


Figure 4

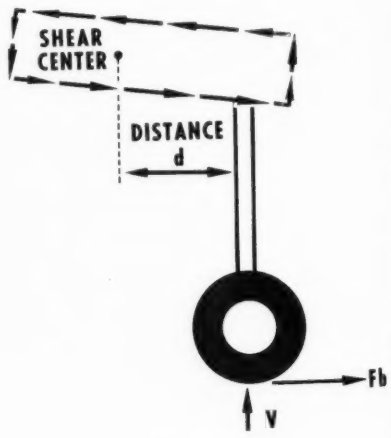


Figure 6

This causes more nose-down torsion in the wing, as shown by the arrowheads in figure 7.

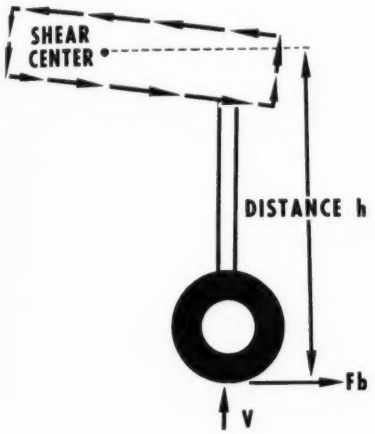


Figure 7

The last force to be considered in this analysis is the aggravating inertia force due to sudden deceleration of the engine mass on impact. It is obvious that all torsional forces in this case are acting in the same direction, as shown in figure 8.

By adding the forces shown in figures 5 through 8, the total simultaneous effect is achieved. In this simplified analysis it is assumed that only the major forces involved are to be considered. The effects of these forces are represented schematically. It is seen from the directions of the forces indicated that shear flows tend to cancel in the front spar, but they all add in the rear spar. In both accidents, failure most likely occurred where the forces were the greatest—in the rear spar.

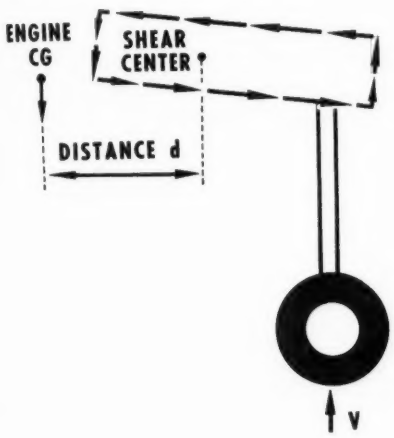


Figure 8

Conclusions:

● Loaded to 28,500 pounds, the Caribou is designed to withstand without any damage a descent velocity of 13 feet per second for landings on a flat surface, with wheels free to spin at touchdown. Simultaneous normal landing forces and drag forces (braking prior to touchdown, wheels digging into a soft surface and restricted from spinning freely, landing into a considerable slope or mound) reduce the rate of vertical descent the aircraft can safely withstand, since a COMBINATION of normal and drag forces determines the maximum safe forces the aircraft can withstand.

● Once normal landing forces have been absorbed and the wheels begin to turn (a fraction of a second after touchdown), brakes can be used as needed. But a simultaneous combination of landing forces and braking must be avoided.

● Though no evidence of fatigue was present in either of the two cases cited, previous overstresses or fatigue can be adequately and safely detected by inspection procedures now in effect. See your -34.

● The Caribou is a dependable and sturdy aircraft. It will do all that the manufacturer says it will do, but don't ask it to do more. Stay within DESIGN LIMITS!

ARMAMENT DEMANDS SPECIAL CARE

During a recent firepower demonstration, an aircraft from another service was set aflame by shrapnel from a napalm bomb it had just dropped. The shrapnel hit the fuel tanks and started the fire.

The accident investigation board determined that the wrong time fuse had been installed. This error resulted in immediate detonation of the bomb rather than the delayed action needed for low altitude bombing.

This accident clearly indicates the high penalties that can be expected without thorough training and supervision of armament personnel and complete operational planning that includes preflight inspections by air crews.

DANGER — YOURS?

Recently, several Mohawks were returned to the manufacturer for modification and maintenance. When the ejection seats were removed from the aircraft, factory personnel discovered some dangerous discrepancies.

Here's what they found in one aircraft:

PILOT'S SEAT

1. The stabilizer drogue shackel line was not stored correctly.
2. O_2 bail-out bottle was almost empty.
3. Shoulder harness and leg restraint were frayed and dirty.
4. Shoulder harness release lever was bent outward.
5. Drogue and parachute were 31 days overdue for repack when they arrived at the factory.
6. The drogue withdrawal line was installed with the light cover only partially covering the withdrawal line. The drogue withdrawal line was twisted.

COPILOT'S SEAT

1. Excessive side play in wedge pack.
2. Shoulder harness frayed.
3. Leg restraint frayed and dirty.

4. O_2 bail-out bottle was in the red area.

5. No lead seal on the drogue chute safety tie.

6. Drogue and parachute were 31 days overdue for repack when they arrived at the factory.

7. The drogue withdrawal line was installed with the light cover only partially covering the withdrawal line. The drogue withdrawal line was twisted.

Here's what they found on another aircraft:

1. O_2 bail-out bottle was half empty.

2. The drogue withdrawal line was installed incorrectly in a manner that could have prevented normal parachute deployment or manual seat separation. When correctly installed, the drogue withdrawal line is stored between the outer and inner flaps. The parachutes and seats of this aircraft were installed with the drogue withdrawal line stored directly on top of the pack, where the pins are inserted through the cone.

And another:

PILOT'S SEAT

1. The wedge pack was loose, with excessive side play on both sides.

2. The parachute withdrawal line was rotated 180°.

3. The parachute withdrawal line emerged from the parachute pack on the aft port side; it should emerge from the forward port side of the chute pack.

4. Sticker clips were not installed.

COPILOT'S SEAT

1. The wedge pack was loose with excessive side play on both sides.

2. The parachute withdrawal line was rotated 180°. The double thickness of webbing on this line should be on the bottom.

3. The parachute withdrawal line emerged from the parachute pack on the aft port side; it should emerge from the forward port side of the chute pack.

4. THE WRONG TYPE SEAT FOR THE AIRCRAFT WAS INSTALLED. THE SEAT INSTALLED INCORPORATED A SLIDE DISCONNECT KNOB, AND THIS TYPE SEAT WAS DESIGNATED FOR ONLY THE YAO.

And another:

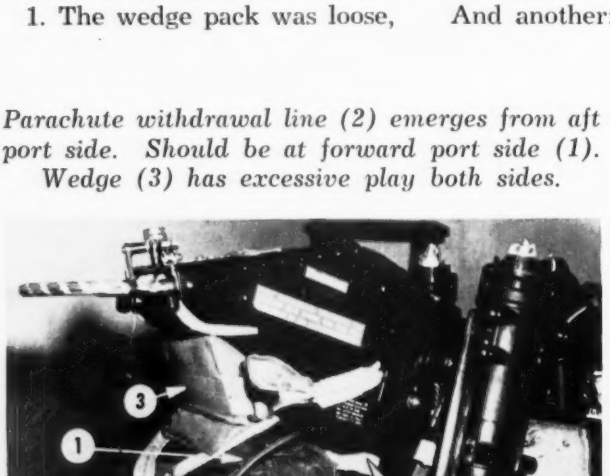
The parachute withdrawal line came out of the left aft side of the parachute pack in a large loop. There was approximately 2 to 3 inches of line that should have been inside of the parachute pack. The link line and slide disconnect pin were placed in the area with the parachute rip pins instead of being on top of the stiffened flap. This latter arrangement could result in a fatality if a pilot had to escape from the seat under various emergency conditions. Rip pins were not safetied.

Small items? Not to the pilot whose life may be at stake!

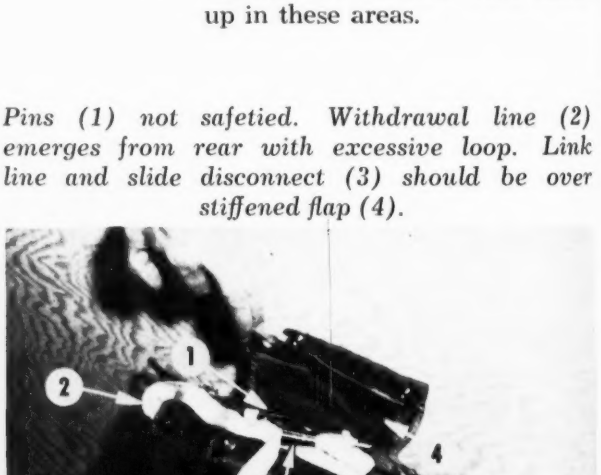
These descriptions and photographs make it clearly evident that some personnel responsible for ejection seat maintenance aren't doing their jobs. Whether it's through carelessness, lack of knowledge, weak supervision, or a combination of all three is unknown.

The cure demands thorough training, strict supervision, and absolute adherence to the appropriate manuals. Now is the time to check the seats in YOUR Mohawks to see how YOU stack up in these areas.

Parachute withdrawal line (2) emerges from aft port side. Should be at forward port side (1). Wedge (3) has excessive play both sides.



Pins (1) not safetied. Withdrawal line (2) emerges from rear with excessive loop. Link line and slide disconnect (3) should be over stiffened flap (4).



From the

USAAVNS

Dept. of Maint.

Starting with OFWAC Class 62-3 last January, the Special Subjects Branch, Department of Maintenance, implemented a revised program of maintenance instruction for all future OFWAC classes. The purpose of this revised POI is "to provide the student aviator with a working knowledge of Army aircraft maintenance activities and familiarize him with the maintenance of the U-6A Beaver."

At the present time all OFWAC students receive considerable training during A phase in basic aircraft maintenance just as they have in the past. All of this training is geared around the O-1 Bird Dog. Before implementation of the revised POI by Special Subjects Branch, the instruction presented in B phase was a continuation of the instruction presented during A phase. Realizing that this instruction was repetitious, the decision was made to change the B phase instruction to a familiarization course on the Beaver. This, in turn, solved the problem of repetition while simultaneously broadening the scope of fixed wing aviation training.

During the past year, lesson plans have been continually reviewed, refined, and improved to the point that a sound, comprehensive 2-week course in the maintenance of the Beaver has been established for the B phase student.

The subject and scope now being taught are

Orientation (2 hrs)
Ignition and electrical systems (1 hr)
Fuel and oil systems (2 hrs)
Trouble shooting R-985 engine (4 hrs)
Aircraft status symbols (1 hr)
Forms and records (2 hrs)
Instrumentation (1 hr)
Inspections (2 hrs)
Flight controls and avionic equipment (1 hr)
Weight and balance (2 hrs)
Maintenance organization (2 hrs)
Maintenance management (2 hrs)
Examination and critique (2 hrs)

As a result of the revised POI, commanders in the field can expect to receive more fully trained and skilled aviators. Furthermore, the aviators will have a better knowledge of the Beaver when they go into their advanced instrument training in C phase. We believe a learned aviator is a safer aviator.

Dept. of Tactics

IN AUGUST 1962, Command and Staff Branch sent observers to Fort Hood, Texas, to observe the participation of the 501st Aviation Battalion in Exercise IRON FIST.

This event was something of a milestone in that it was the first time a ROAD Division Aviation Battalion has participated in a full-scale divisional FEX. The observers reported the exercise to be a success. Data and experience, particularly in command, staff and logistical matters, obtained during this exercise will be invaluable in the further development and refinement of the ROAD Aviation Battalion employment instructional material.

The planning phase for LOGEX 63 has begun. Aviation participation in this annual logistical exercise is a matter of responsibility and interest to Research, Training Literature, and Staff Division. The LOGEX will be held at Fort Lee, Va., during the period 5 to 12 May 1963. Aviation play during LOGEX provides data and situations wherein all levels of logistical command and staff are exercised in problems relative to aviation support, maintenance and supply. Army Aviation Command and Staff Officers Course (AACSOC) students attend the annual LOGEX and participate in various capacities, providing an unusually challenging and effective training vehicle.

MODIFIED UH-1B GIVES IMPROVED PERFORMANCE

UNOFFICIAL test results of the U. S. Army's Transportation Research Command high-performance helicopter test program has confirmed that significant improvement can be made in performance of existing and future service helicopters.

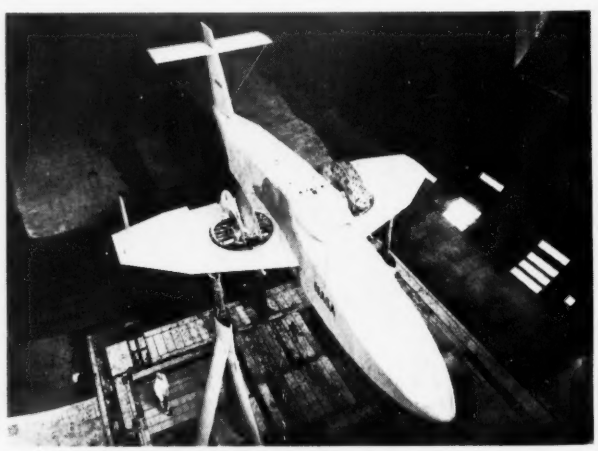
A modified UH-1B research helicopter, at normal gross weight, recently was flown at level flight speed in excess of 152 kt. This exceeded the normal maximum speed of the basic machine of 120 kt and the existing class E1D world record of 138 kt.

Increased performance was accomplished by a series of modifications to decrease fuselage drag, thus decreasing the power requirements of both main and tail rotor in high-speed flight. These principal modifications were incorporated: tilting pylon which allows the rotor to be tilted forward while keeping the fuselage attitude at its minimum drag position, new engine inlets and streamlined pylon, streamlined landing gear, cambered vertical tail surface to unload tail rotor in high-speed flight, and fuselage fairings to eliminate turbulent flow.

Increased speed can also be traded-off for increased range and endurance at normal UH-1B cruise speeds of 117 kt. At this speed, the modified UH-1B fuel consumption is reduced 25 percent from the normal helicopter, thus significantly increasing range and endurance or decreasing the fuel supply required for the same range.

Stability and control, vibration, and blade stresses are improved in comparison to the normal basic helicopter.

An extension of the flight tests has been authorized to install wings and auxiliary propulsion to the test helicopter to provide data on performance, stability and control, vibration and loads at speeds up to 191 kt.

Based on results obtained to date and analysis performed by TRECOM engineers, the dream of a 174 kt helicopter is definitely possible, and speeds in the 195-217 kt range should be achievable in the near future.

NATIONAL Aeronautics & Space Administration's third *full-scale model* V/STOL airplane has successfully completed first phase wind tunnel tests at Ames Research Center, Moffett Field, Calif. The tests were conducted as part of NASA's program to evaluate the General Electric lift-fan V/STOL propulsion system. The current NASA model is similar to the design configuration that will be used for the XV-5A (formerly VZ-11) lift-fan V/STOL research aircraft being built by the Ryan Aeronautical Company for the U. S. Army. Tests included simulated step-by-step flight operation from takeoff through transition and were run with wind tunnel speeds ranging from 0 to 120 kt and with lift-fans operating up to 2640 rpm or full power.